Valuation

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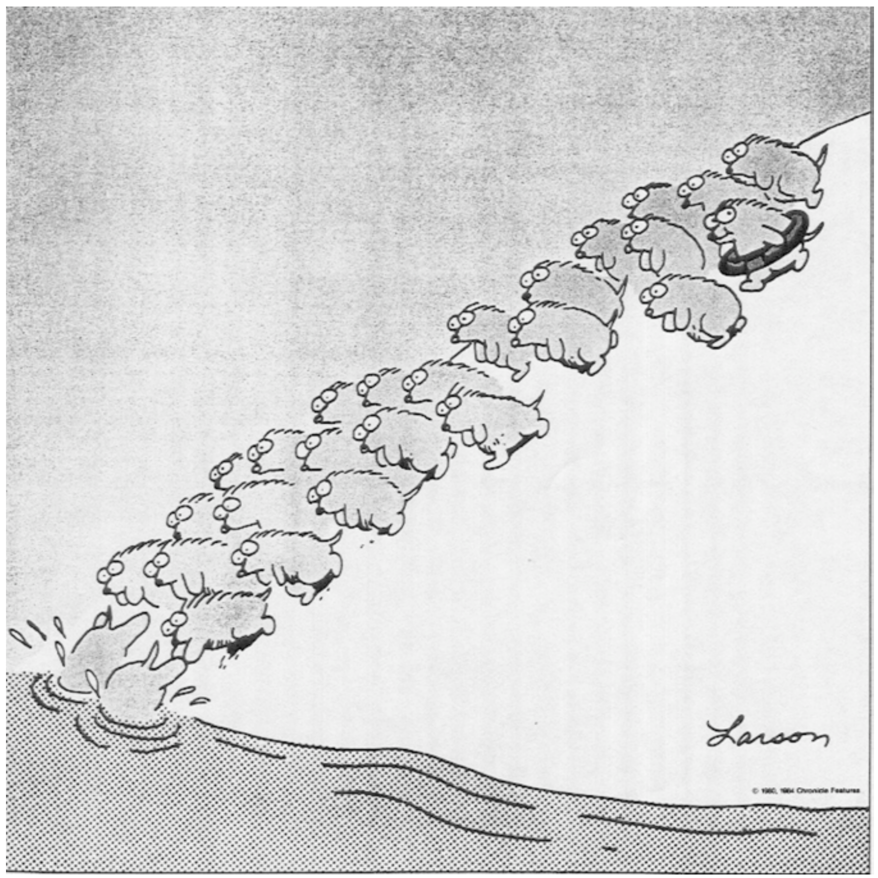
For the valuations in this presentation, go to Seminars/ Presentations

Some Initial Thoughts

" One hundred thousand lemmings cannot be wrong"

Graffiti



Misconceptions about Valuation

- Myth 1: A valuation is an objective search for “true” value
  - Truth 1.1: All valuations are biased. The only questions are how much and in which direction.
  - Truth 1.2: The direction and magnitude of the bias in your valuation is directly proportional to who pays you and how much you are paid.
- Myth 2.: A good valuation provides a precise estimate of value
  - Truth 2.1: There are no precise valuations
  - Truth 2.2: The payoff to valuation is greatest when valuation is least precise.
- Myth 3: . The more quantitative a model, the better the valuation
  - Truth 3.1: One’s understanding of a valuation model is inversely proportional to the number of inputs required for the model.
  - Truth 3.2: Simpler valuation models do much better than complex ones.

Approaches to Valuation

- **Discounted cashflow valuation**, relates the value of an asset to the present value of expected future cashflows on that asset.
- **Relative valuation**, estimates the value of an asset by looking at the pricing of 'comparable' assets relative to a common variable like earnings, cashflows, book value or sales.
- **Contingent claim valuation**, uses option pricing models to measure the value of assets that share option characteristics.

Discounted Cash Flow Valuation

- **What is it**: In discounted cash flow valuation, the value of an asset is the present value of the expected cash flows on the asset.
- **Philosophical Basis**: Every asset has an intrinsic value that can be estimated, based upon its characteristics in terms of cash flows, growth and risk.
- **Information Needed**: To use discounted cash flow valuation, you need
  - to estimate the life of the asset
  - to estimate the cash flows during the life of the asset
  - to estimate the discount rate to apply to these cash flows to get present value
- **Market Inefficiency**: Markets are assumed to make mistakes in pricing assets across time, and are assumed to correct themselves over time, as new information comes out about assets.

Discounted Cashflow Valuation: Basis for Approach

$$\text{Value of asset} = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \frac{CF_4}{(1+r)^4} \ldots\ldots + \frac{CF_n}{(1+r)^n}$$

where CF_t is the <u>expected cash flow</u> in period t, r is the discount rate appropriate given the riskiness of the cash flow and n is the life of the asset.

Proposition 1: For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.

Proposition 2: Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may however have greater growth and higher cash flows to compensate.

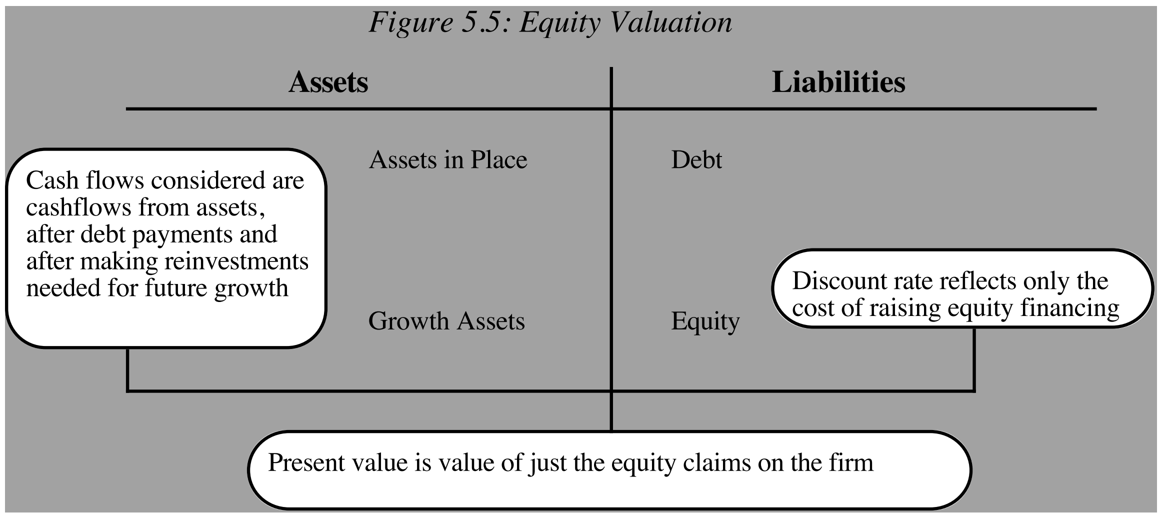
DCF Choices: Equity Valuation versus Firm Valuation

Firm Valuation: Value the entire business

Assets		Liabilities	
Existing Investments Generate cashflows today Includes long lived (fixed) and short-lived(working capital) assets	Assets in Place	Debt	Fixed Claim on cash flows Little or No role in management *Fixed Maturity* *Tax Deductible*
Expected Value that will be created by future investments	Growth Assets	Equity	Residual Claim on cash flows Significant Role in management *Perpetual Lives*

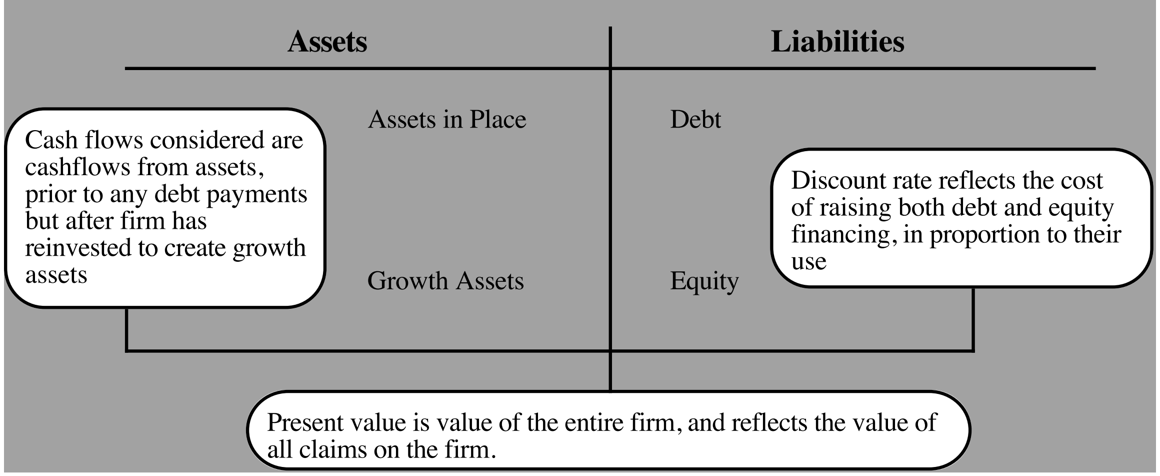
Equity valuation: Value just the equity claim in the business

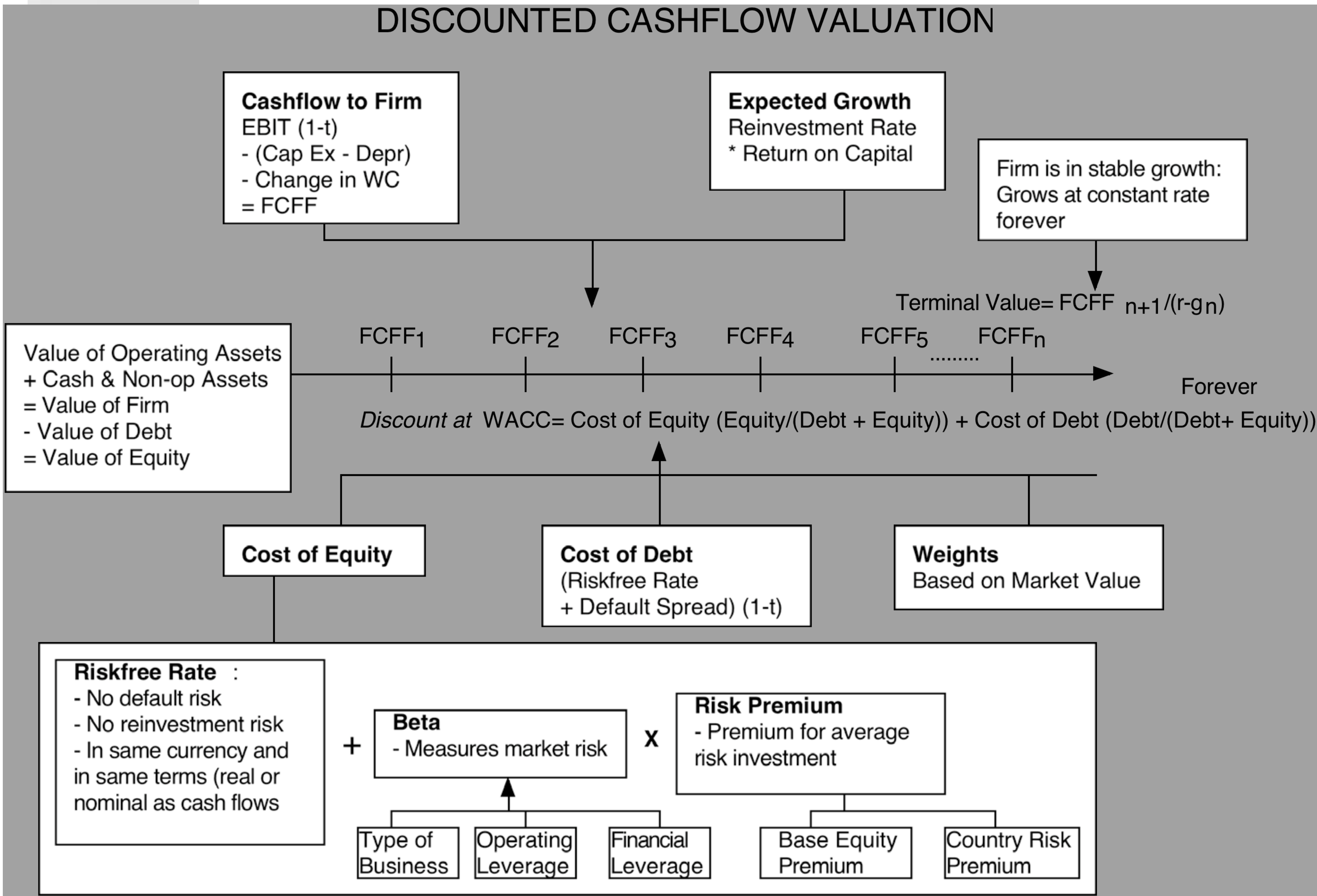
Equity Valuation



Firm Valuation

Figure 5.6: Firm Valuation




DISCOUNTED CASHFLOW VALUATION
Cashflow to Firm
EBIT (1-t)
- (Cap Ex - Depr)
- Change in WC
= FCFF
Expected Growth
Reinvestment Rate
* Return on Capital
Firm is in stable growth:
Grows at constant rate
forever
Terminal Value= FCFF n+1/(r-g n)
Value of Operating Assets
+ Cash & Non-op Assets
= Value of Firm
- Value of Debt
= Value of Equity
FCFF1
FCFF2
FCFF3
FCFF4
FCFF5
....
FCFFn
Forever
Discount at WACC= Cost of Equity (Equity/(Debt + Equity)) + Cost of Debt (Debt/(Debt+ Equity))
Cost of Equity
Cost of Debt
(Riskfree Rate
+ Default Spread) (1-t)
Weights
Based on Market Value
Riskfree Rate :
- No default risk
- No reinvestment risk
- In same currency and
in same terms (real or
nominal as cash flows
+
Beta
- Measures market risk
X
Risk Premium
- Premium for average
risk investment
Type of
Business
Operating
Leverage
Financial
Leverage
Base Equity
Premium
Country Risk
Premium

Hyundai Heavy: Status Quo ($)

Current Cashflow to Firm
EBIT(1-t) : 1,269 Billion Won
- Nt CpX 519
- Chg WC 135
= FCFF 615
Reinvestment Rate = 654/1269=51.5%
Return on capital = 1269/3390 =37.45%

Reinvestment Rate
50%

Return on Capital
30%

Expected Growth in EBIT (1-t)
.50*.30=.15
15%

Stable Growth
g = 5%; Beta = 1.20;
Country Premium= 0.8%
Cost of capital = 9.42%
ROC= 9.42%
Reinvestment Rate=g/ROC
=5/9.42 = 53.1%

Terminal Value$_5$= 1258(.0942-.05) = 28,471

Wn Cashflows

Year	1	2	3	4	5
EBIT (1-t)	1,460	1,679	1,931	2,220	2,553
- Reinvestment	730	839	965	1,110	1,277
FCFF	730	839	965	1,110	1,277

Term Yr
2,681
1,423
=1,258

Op. Assets	20,211
+ Cash:	3,612
+ Non-0p	3,937
- Debt	186
=Equity	27,574
-Options	0
Value/Share	362.82
(362,820 Won/Sh)	

Discount at $ Cost of Capital (WACC) = 11.3% (.993) + 4.75% (0.007) = 11.26%

On June 1, 2008
Hyundai Heavy traded at
350,000 Won/share.

Cost of Equity
11.30%

Cost of Debt
(5%+0.8%+0.75%)(1-.275)
= 4.75%

Weights
E = 99.3% D = 0.7%

Riskfree Rate:
Won Riskfree Rate= 5%

+

Beta
1.50

X

Mature market premium
4 %

+

Lambda
0.25

X

Country Equity Risk Premium
1.20%

Unlevered Beta for Sectors: 0.75

Firm's D/E Ratio: 26.84%

Country Default Spread
0.8%

X

Rel Equity Mkt Vol
1.20

Kristin's Kandy: Status Quo

Current Cashflow to Firm
EBIT(1-t) : 300,000
- Nt CpX 100,000
- Chg WC 40,000
= FCFF 160,000
Reinvestment Rate = 46.67%

Reinvestment Rate
46.67%

Expected Growth in EBIT (1-t)
.4667*.1364= .0636
6.36%

Return on Capital
13.64%

Stable Growth
g = 4%; Beta =3.00;
ROC= 12.54%
Reinvestment Rate=31.90%

Terminal Value$_{10}$= 289/(.1254-.04) = 3,403

Firm Value: 2,571
+ Cash 125
- Debt: 900
=Equity 1,796
Liq. Discount 12.5%
Equity value 1572

Year	1	2	3	4	5	Term Yr
EBIT (1-t)	$319	$339	$361	$384	$408	425
- Reinvestment	$149	$158	$168	$179	$191	136
=FCFF	$170	$181	$193	$205	$218	289

Discount at Cost of Capital (WACC) = 16.26% (.70) + 3.30% (.30) = 12.37%

Cost of Equity
16.26%

Cost of Debt
(4.5%+1.00)(1-.40)
= 3.30%
Synthetic rating = A-

Weights
E =70% D = 30%

Riskfree Rate:
Riskfree rate = 4.50%
(10-year T.Bond rate)

+

Beta 0.98 / Correlation 0.33

Total Beta
2.94

X

Risk Premium
4.00%

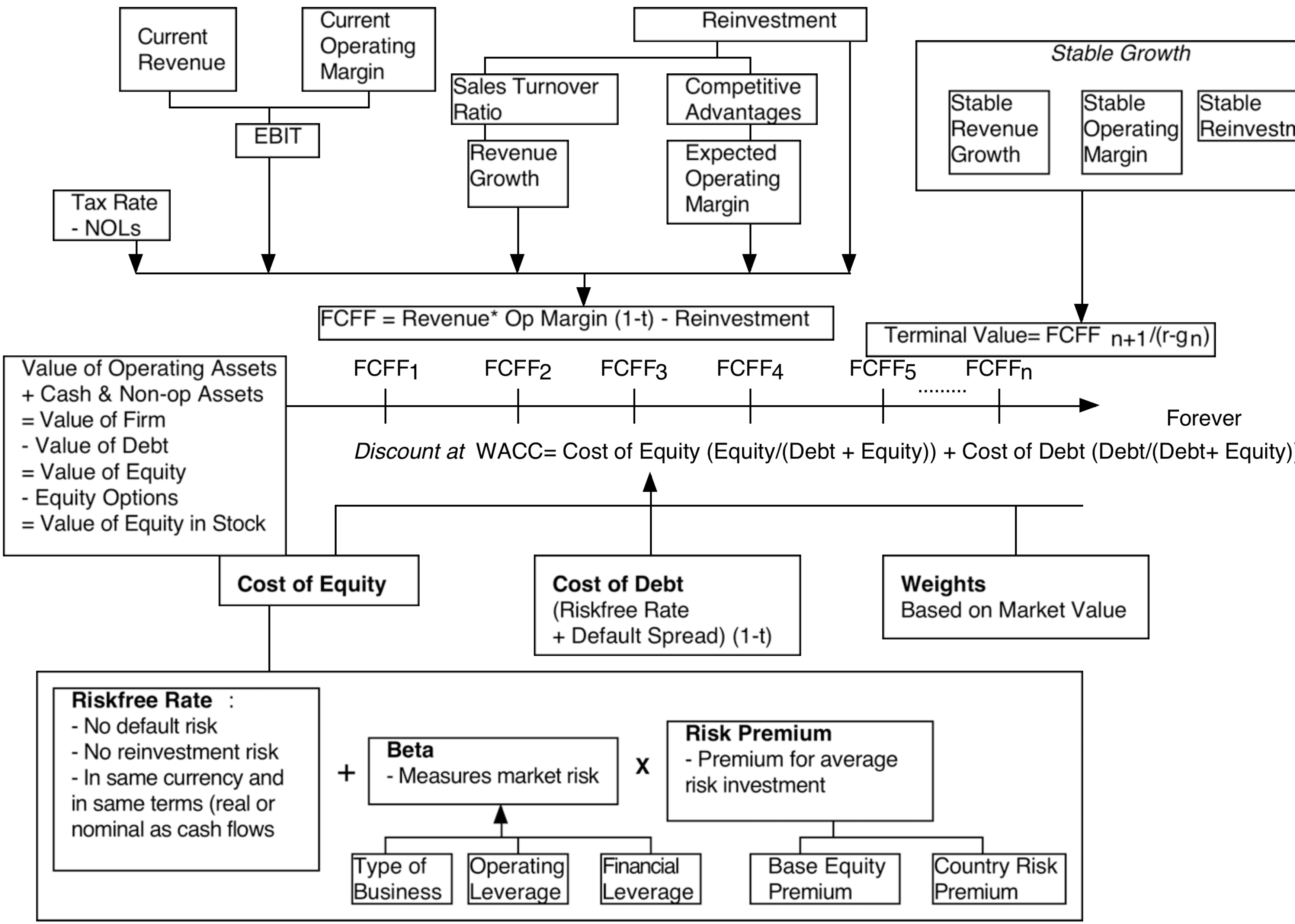
Unlevered Beta for Sectors: 0.82

Firm's D/E Ratio: 1.69%

Mature risk premium
4%

Country Risk Premium
0%

Discounted Cash Flow Valuation: High Growth with Negative Earnings



Reinvestment:
Cap ex includes acquisitions
Working capital is 3% of revenues

Current Revenue $ 1,117

Current Margin: -36.71%

EBIT -410m

NOL: 500 m

Sales Turnover Ratio: 3.00

Competitive Advantages

Revenue Growth: 42%

Expected Margin: -> 10.00%

Stable Growth

Stable Revenue Growth: 6%

Stable Operating Margin: 10.00%

Stable ROC=20%
Reinvest 30% of EBIT(1-t)

Terminal Value= 1881/(.0961-.06) =52,148

	1	2	3	4	5	6	7	8	9	10	Term. Year
Revenues	$2,793	5,585	9,774	14,661	19,059	23,862	28,729	33,211	36,798	39,006	$41,346
EBIT	-$373	-$94	$407	$1,038	$1,628	$2,212	$2,768	$3,261	$3,646	$3,883	10.00%
EBIT (1-t)	-$373	-$94	$407	$871	$1,058	$1,438	$1,799	$2,119	$2,370	$2,524	35.00%
- Reinvestment	$559	$931	$1,396	$1,629	$1,466	$1,601	$1,623	$1,494	$1,196	$736	$2,688
FCFF	-$931	-$1,024	-$989	-$758	-$408	-$163	$177	$625	$1,174	$1,788	$ 807
											$1,881

Forever

	1	2	3	4	5	6	7	8	9	10
Cost of Equity	12.90%	12.90%	12.90%	12.90%	12.90%	12.42%	12.30%	12.10%	11.70%	10.50%
Cost of Debt	8.00%	8.00%	8.00%	8.00%	8.00%	7.80%	7.75%	7.67%	7.50%	7.00%
AT cost of debt	8.00%	8.00%	8.00%	6.71%	5.20%	5.07%	5.04%	4.98%	4.88%	4.55%
Cost of Capital	12.84%	12.84%	12.84%	12.83%	12.81%	12.13%	11.96%	11.69%	11.15%	9.61%

Value of Op Assets	$ 14,910
+ Cash	$ 26
= Value of Firm	$14,936
- Value of Debt	$ 349
= Value of Equity	$14,587
- Equity Options	$ 2,892
Value per share	$ 34.32

Cost of Equity
12.90%

Cost of Debt
6.5%+1.5%=8.0%
Tax rate = 0% -> 35%

Weights
Debt= 1.2% -> 15%

Riskfree Rate :
T. Bond rate = 6.5%

\+

Beta
1.60 -> 1.00

X

Risk Premium
4%

Internet/ Retail

Operating Leverage

Current D/E: 1.21%

Base Equity Premium

Country Risk Premium

Amazon.com
January 2000
Stock Price = $ 84

I. Estimating Discount Rates

Cost of Equity

Preferably, a bottom-up beta, based upon other firms in the business, and firm's own financial leverage

Cost of Equity = Riskfree Rate + Beta * (Risk Premium)

Has to be in the same currency as cash flows, and defined in same terms (real or nominal) as the cash flows

Historical Premium
1. Mature Equity Market Premium: Average premium earned by stocks over T.Bonds in U.S.
2. Country risk premium = Country Default Spread* ($\sigma_{Equity}/\sigma_{Country\ bond}$)

or

Implied Premium
Based on how equity market is priced today and a simple valuation model

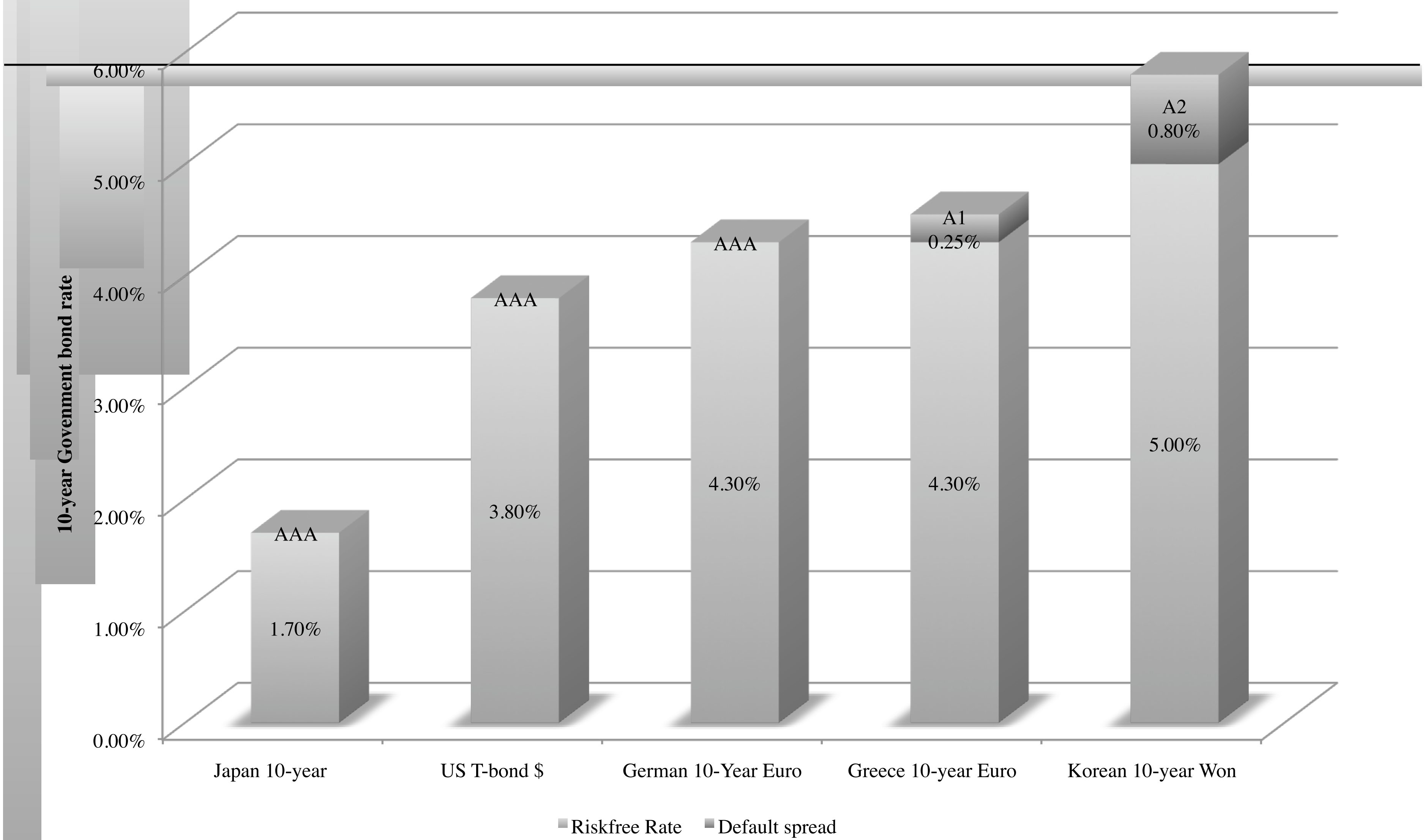
A Riskfree Rate

For a rate to be riskfree in valuation, it has to be long term, default free and currency matched (to the cash flows)

- Assume that you are valuing Hyundai Heavy Industries in Korean Won for a US institutional investor. Which of the following rates would you use as a riskfree rate?
- ❑ The rate on the US 10-year treasury bond (3.8%)
- ❑ The rate on the Korean (Won) 10-year government bond (5.8%)
- ❑ Other

How would your answer change if you were valuing Hyundai in US dollars for a Korean institutional investor?

Riskfree Rates - Different Currencies



Everyone uses historical premiums, but..

- The historical premium is the premium that stocks have historically earned over riskless securities.
- Practitioners never seem to agree on the premium; it is sensitive to
  - How far back you go in history…
  - Whether you use T.bill rates or T.Bond rates
  - Whether you use geometric or arithmetic averages.
- For instance, looking at the US:

	Arithmetic average		*Geometric Average*	
Historical Period	Stocks - T.Bills	Stocks - T.Bonds	Stocks - T.Bills	Stocks - T.Bonds
1928-2007	7.78%	6.42%	5.94%	4.79%
1967-2007	5.94%	4.33%	4.75%	3.50%
1997-2007	5.26%	2.68%	4.69%	2.34%

Assessing Country Risk Using Currency Ratings: Asia

Country	*Local currency rating*	*Typical default spread*
Cambodia	B2	4.00%
China	A1	0.70%
Fiji Islands	Ba2	2.50%
Hong Kong	Aa2	0.50%
India	Ba2	2.50%
Indonesia	Ba3	3.00%
Japan	AAA	0.00%
Korea	A2	0.80%
Macao	Aa3	0.60%
Malaysia	A3	0.85%
Mongolia	B1	3.50%
Pakistan	B1	3.50%
Philippines	B1	3.50%
Singapore	Aaa	0.00%
Taiwan	Aa3	0.60%
Thailand	Baa1	1.00%
Vietnam	Ba3	3.00%

Using Country Ratings to Estimate Equity Spreads

- Country ratings measure default risk. While default risk premiums and equity risk premiums are highly correlated, one would expect equity spreads to be higher than debt spreads.
  - One way to adjust the country spread upwards is to use information from the US market. In the US, the equity risk premium has been roughly twice the default spread on junk bonds.
  - Another is to multiply the bond spread by the relative volatility of stock and bond prices in that market. For example,
    - Standard Deviation in KOSPI = 18%
    - Standard Deviation in Korean government bond= 12%
    - Adjusted Equity Spread = 0.80% (18/12) = 1.20%

From Country Risk Premiums to Corporate Risk premiums

- Approach 1: Assume that every company in the country is equally exposed to country risk. In this case,

  E(Return) = Riskfree Rate + Country ERP + Beta (US premium)

- Approach 2: Assume that a company's exposure to country risk is similar to its exposure to other market risk.

  E(Return) = Riskfree Rate + Beta (US premium + Country ERP)

- Approach 3: Treat country risk as a separate risk factor and allow firms to have different exposures to country risk (perhaps based upon the proportion of their revenues come from non-domestic sales)

  E(Return)=Riskfree Rate+ β (US premium) + λ (Country ERP)

  Country ERP: Additional country equity risk premium

Estimating Company Exposure to Country Risk

- Different companies should be exposed to different degrees to country risk. For instance, a Korean firm that generates the bulk of its revenues in Western Europe and the US should be less exposed to country risk than one that generates all its business within Korea.
- The factor "λ" measures the relative exposure of a firm to country risk. One simplistic solution would be to do the following:

  λ = % of revenues domestically$_{\text{firm}}$/ % of revenues domestically$_{\text{avg firm}}$

  Consider two firms – HyumdaI Heavy Industries and Megastudy, both Korean companies. The former gets about 20% of its revenues in Korea and the latter gets 100%. The average Korean firm gets about 80% of its revenues in Korea:

  $\lambda_{\text{Hyundai}} = 20\%/80\% = 0.25$

  $\lambda_{\text{Megastudy}} = 100\%/80\% = 1.25$
- There are two implications
  - A company's risk exposure is determined by where it does business and not by where it is located
  - Firms might be able to actively manage their country risk exposures

Estimating E(Return) for Hyundai Heavy Industries

- Assume that the beta for Hyundai Heavy is 1.50, and that the riskfree rate used is 5%. Also assume that the historical premium for the US (4.79%) is a reasonable estimate of a mature market risk premium.
- Approach 1: Assume that every company in the country is equally exposed to country risk. In this case,

E(Return) = 5% + 1.2% + 1.5 (4.79%) = 13.39%

- Approach 2: Assume that a company's exposure to country risk is similar to its exposure to other market risk.

E(Return) = 5% + 1.5 (4.79%+ 1.2%) = 13.99%

- Approach 3: Treat country risk as a separate risk factor and allow firms to have different exposures to country risk (perhaps based upon the proportion of their revenues come from non-domestic sales)

E(Return)= 5% + 1.5(4.79%) + 0.25 (1.2%) + 0.50 (2%) = 13.49%

Reflects revenues in Eastern Europe, China and the Rest of Asia

An alternate view of ERP: Watch what I pay, not what I say..

- You can back out an equity risk premium from stock prices:

Year	Dividend Yield	Buybacks/Index	Yield
2001	1.37%	1.25%	2.62%
2002	1.81%	1.58%	3.39%
2003	1.61%	1.23%	2.84%
2004	1.57%	1.78%	3.35%
2005	1.79%	3.11%	4.90%
2006	1.77%	3.38%	5.15%
2007	1.89%	4.00%	5.89%
Average yield between 2001-2007 =			4.02%

Between 2001 and 2007 dividends and stock buybacks averaged 4.02% of the index each year.

Analysts expect earnings to grow 5% a year for the next 5 years. We will assume that dividends & buybacks will keep pace..
Last year's cashflow (59.03) growing at 5% a year

After year 5, we will assume that earnings on the index will grow at 4.02%, the same rate as the entire economy (= riskfree rate).

61.98 65.08 68.33 71.75 75.34

January 1, 2008
S&P 500 is at 1468.36
4.02% of 1468.36 = 59.03

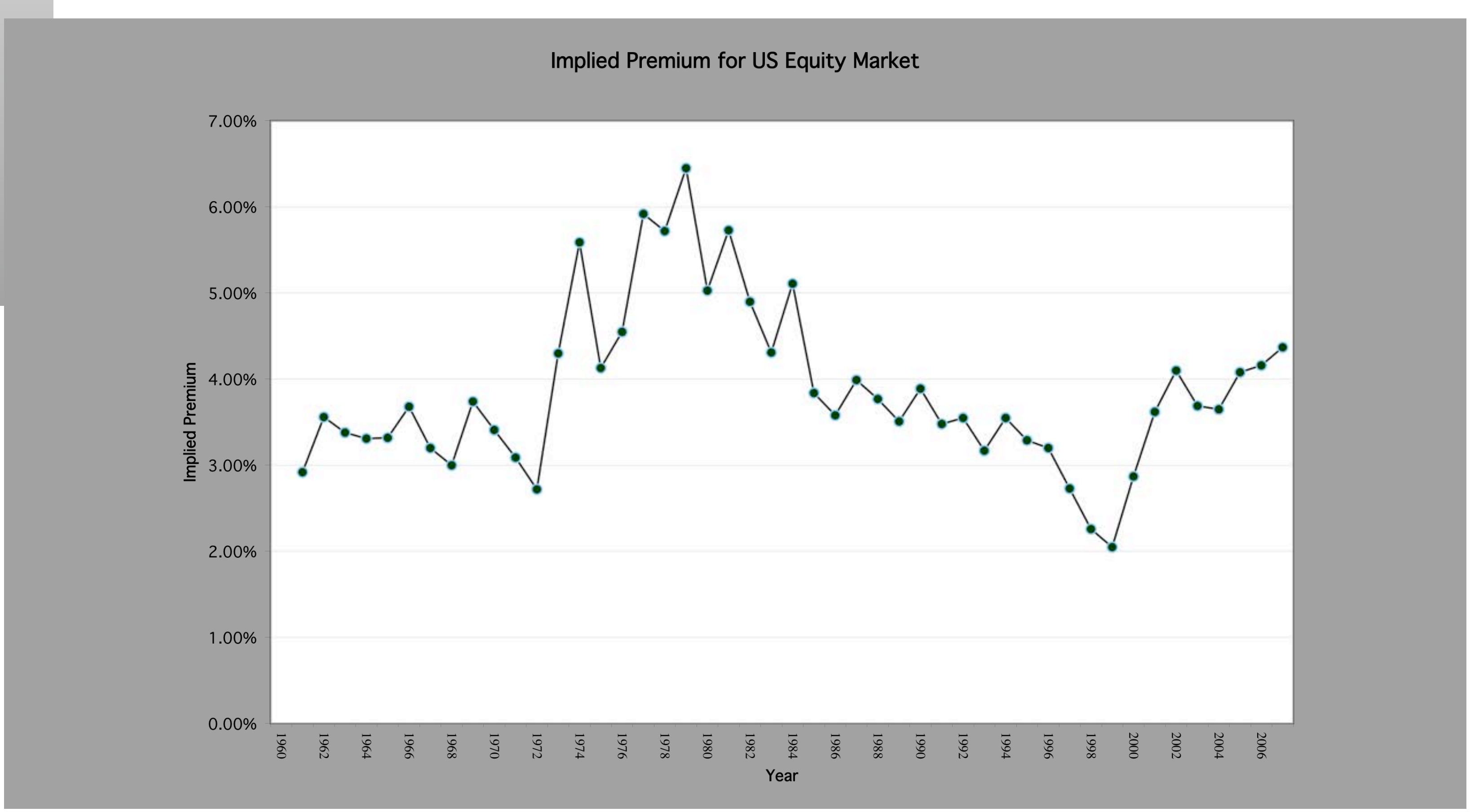
Solving for the implied premium…

- If we know what investors paid for equities at the beginning of 2007 and we can estimate the expected cash flows from equities, we can solve for the rate of return that they expect to make (IRR):

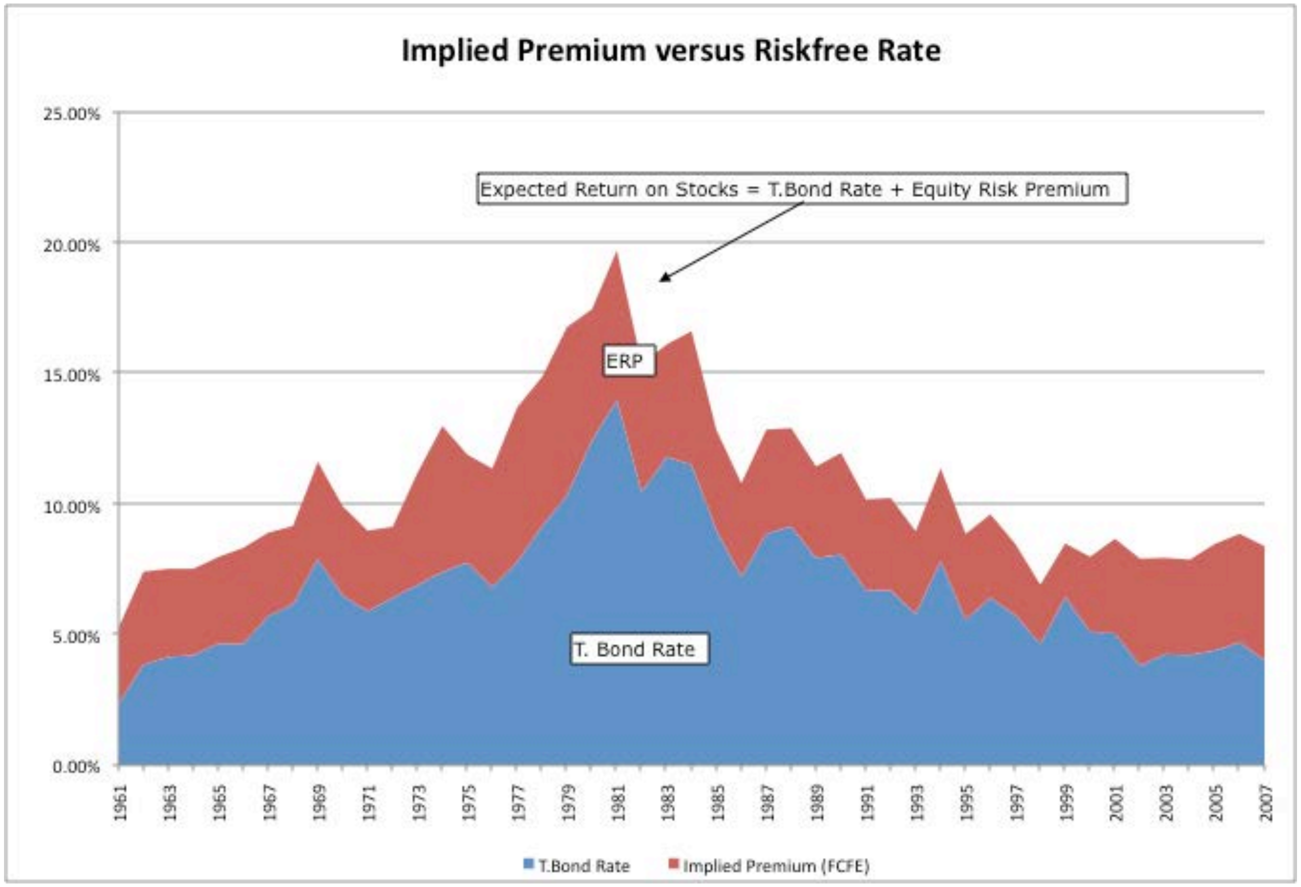
$$1468.36 = \frac{61.98}{(1+r)} + \frac{65.08}{(1+r)^2} + \frac{68.33}{(1+r)^3} + \frac{71.75}{(1+r)^4} + \frac{75.34}{(1+r)^5} + \frac{75.35(1.0402)}{(r-.0402)(1+r)^5}$$

- Expected Return on Stocks = 8.39%
- Implied Equity Risk Premium = Expected Return on Stocks - T.Bond Rate =8.39% - 4.02% = 4.37%

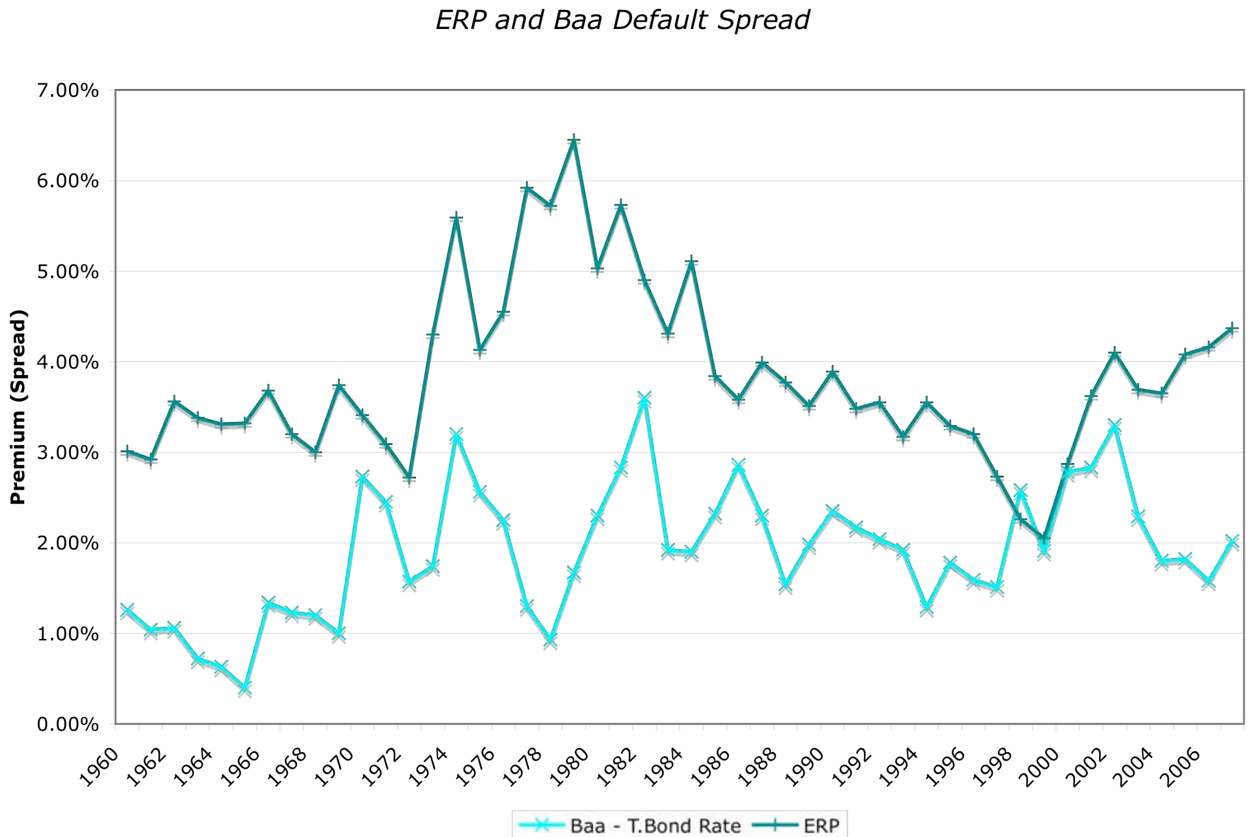
Implied Premiums in the US



Implied Premium versus RiskFree Rate



Equity Risk Premiums and Bond Default Spreads



Which equity risk premium should you use for the US?

- *Historical Risk Premium*: When you use the historical risk premium, you are assuming that premiums will revert back to a historical norm and that the time period that you are using is the right norm.
- *Current Implied Equity Risk premium*: You are assuming that the market is correct in the aggregate but makes mistakes on individual stocks. If you are required to be market neutral, this is the premium you should use. (What types of valuations require market neutrality?)
- *Average Implied Equity Risk premium*: The average implied equity risk premium between 1960-2007 in the United States is about 4%. You are assuming that the market is correct on average but not necessarily at a point in time.

Implied Premium for KOSPI: May 30, 2008

- Level of the Index = 1825
- FCFE on the Index = 3.75% (Estimated FCFE for companies in index as % of market value of equity)
- Other parameters
  - Riskfree Rate = 5% (Won)
  - Expected Growth (in Won)
    - Next 5 years = 7.5% (Used expected growth rate in Earnings)
    - After year 5 = 5%
- Solving for the expected return:
  - Expected return on Equity = 9.39%
  - Implied Equity premium = 9.39% - 5% = 4.39%
- Effect on valuation
  - Hyundai's value @ historical premium (4%) + country (1.2%) : 350,000 Wn /share
  - Hyundai's value @ implied premium: 352,000 Wn/ share

Estimating Beta

- The standard procedure for estimating betas is to regress stock returns (R_j) against market returns (R_m) -

$$R_j = a + b\ R_m$$

  - where a is the intercept and b is the slope of the regression.
- The slope of the regression corresponds to the beta of the stock, and measures the riskiness of the stock.
- This beta has three problems:
  - It has high standard error
  - It reflects the firm's business mix over the period of the regression, not the current mix
  - It reflects the firm's average financial leverage over the period rather than the current leverage.

Beta Estimation: Amazon

<HELP> for explanation, <MENU> for similar functions. DG26 Equity **BETA**

HISTORICAL BETA

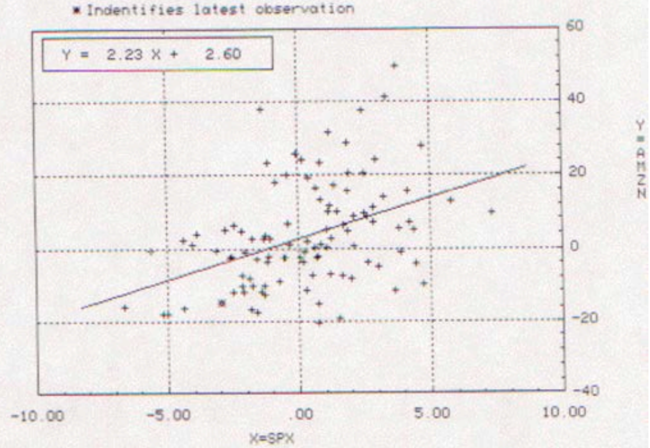
AMZN US AMAZON.COM INC

Relative Index SPX S&P 500 INDEX

* Indentifies latest observation

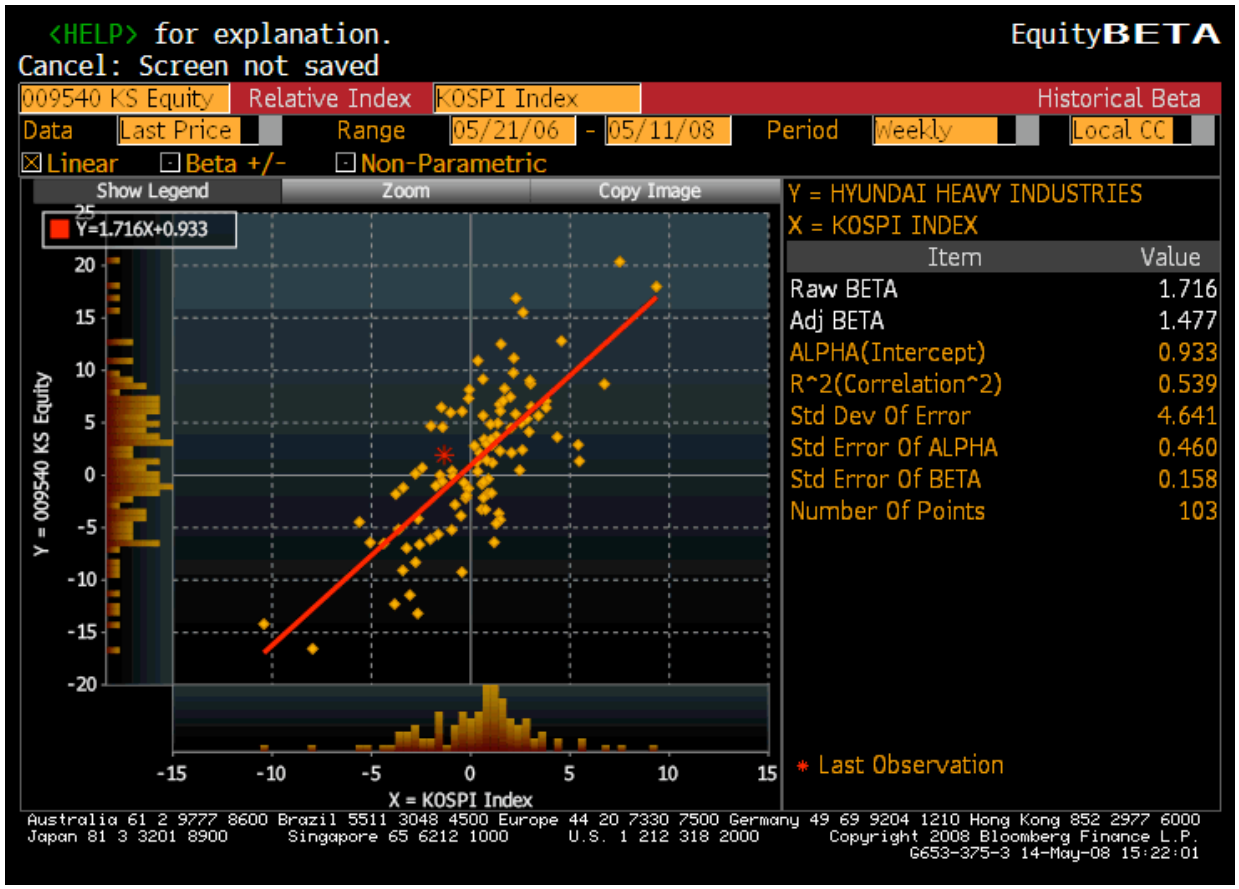
Period W Weekly
Range 2/27/98 To 2/18/00
Market T Trade

ADJ BETA	1.82
RAW BETA	2.23
Alpha (Intercept)	2.60
R2 (Correlation)	.17
Std Dev of Error	13.20
Std Error of Beta	.50
Number of Points	103

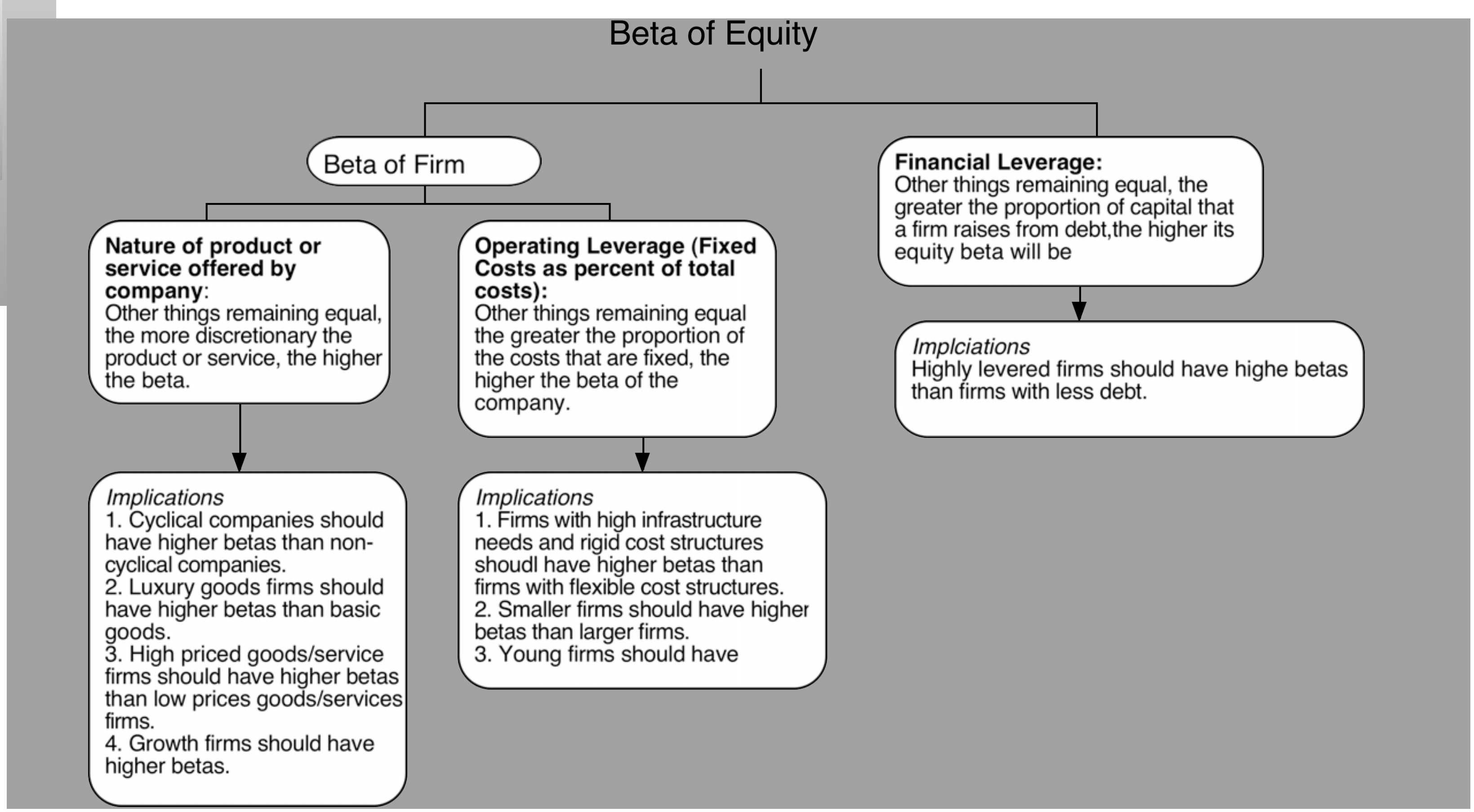


Adj beta = (0.67) * Raw Beta + (0.33) * 1.0

Beta Estimation for Hyundai Heavy: The Index Effect



Determinants of Betas



Bottom-up Betas

Step 1: Find the business or businesses that your firm operates in.

Step 2: Find publicly traded firms in each of these businesses and obtain their regression betas. Compute the simple average across these regression betas to arrive at an average beta for these publicly traded firms. Unlever this average beta using the average debt to equity ratio across the publicly traded firms in the sample.
Unlevered beta for business = Average beta across publicly traded firms/ (1 + (1- t) (Average D/E ratio across firms))

Step 3: Estimate how much value your firm derives from each of the different businesses it is in.

Step 4: Compute a weighted average of the unlevered betas of the different businesses (from step 2) using the weights from step 3.
Bottom-up Unlevered beta for your firm = Weighted average of the unlevered betas of the individual business

Step 5: Compute a levered beta (equity beta) for your firm, using the market debt to equity ratio for your firm.
Levered bottom-up beta = Unlevered beta (1+ (1-t) (Debt/Equity))

Possible Refinements

If you can, adjust this beta for differences between your firm and the comparable firms on operating leverage and product characteristics.

While revenues or operating income are often used as weights, it is better to try to estimate the value of each business.

If you expect the business mix of your firm to change over time, you can change the weights on a year-to-year basis.

If you expect your debt to equity ratio to change over time, the levered beta will change over time.

Hyundai: Breaking down businesses

Business	Revenues	EV/Sales	Value	Value Weight	Unlevered beta
Shipbuilding	8341	3.23	26941	63.73%	1.60
Offshore & Engineering	2563	1.97	5049	11.94%	1.44
Industrial plant	1200	1.55	1860	4.40%	1.29
Engine and Machinery	2252	1.36	3063	7.24%	1.21
Electro Electric System	1753	1.8	3155	7.46%	1.19
Construction Equipment	1823	1.21	2206	5.22%	1.29
			42274	100.00%	1.49

Bottom up Beta Estimates

Company	*Comparable Companies*	*Unlevered Beta*	*Levered Beta*
Hyundai Heavy	See last page	1.49	1.49 (1 + (1-.275) (.0069) = 1.50
Amazon (First 5 years)	Internet Retailers	1.58	1.58 (1- (1-0) (.0121) = 1.60
Amazon (After year 5)	Specialty Retailers		1.00
Kristin Kandy	Food Processing companies with market cap < $ 250 million	0.78	0.78 (1+(1-.4) (30/70)) = 0.98

Small Firm and Other Premiums

- It is common practice to add premiums on to the cost of equity for firm-specific characteristics. For instance, many analysts add a small stock premium of 3-3.5% (historical premium for small stocks over the market) to the cost of equity for smaller companies.
- Adding arbitrary premiums to the cost of equity is always a dangerous exercise. If small stocks are riskier than larger stocks, we need to specify the reasons and try to quantify them rather than trust historical averages. (You could argue that smaller companies are more likely to serve niche (discretionary) markets or have higher operating leverage and adjust the beta to reflect this tendency).

Is Beta an Adequate Measure of Risk for a Private Firm?

The owners of most private firms are not diversified. Beta measures the risk added on to a diversified portfolio. Therefore, using beta to arrive at a cost of equity for a private firm will

a) Under estimate the cost of equity for the private firm
b) Over estimate the cost of equity for the private firm
c) Could under or over estimate the cost of equity for the private firm

Total Risk versus Market Risk

- Adjust the beta to reflect total risk rather than market risk. This adjustment is a relatively simple one, since the R squared of the regression measures the proportion of the risk that is market risk.

  Total Beta = Market Beta / Correlation of the sector with the market

- To estimate the beta for Kristin Kandy, we begin with the bottom-up unlevered beta of food processing companies:
  - Unlevered beta for publicly traded food processing companies = 0.78
  - Average correlation of food processing companies with market = 0.333
  - Unlevered total beta for Kristin Kandy = 0.78/0.333 = 2.34
  - Debt to equity ratio for Kristin Kandy = 0.3/0.7 (assumed industry average)
  - Total Beta = 2.34 (1- (1-.40)(30/70)) = 2.94
  - Total Cost of Equity = 4.50% + 2.94 (4%) = 16.26%

When would you use this total risk measure?

- Under which of the following scenarios are you most likely to use the total risk measure:
  - when valuing a private firm for an initial public offering
  - when valuing a private firm for sale to a publicly traded firm
  - when valuing a private firm for sale to another private investor
- Assume that you own a private business. What does this tell you about the best potential buyer for your business?

From Cost of Equity to Cost of Capital

Cost of borrowing should be based upon
(1) synthetic or actual bond rating
(2) default spread
Cost of Borrowing = Riskfree rate + Default spread

Marginal tax rate, reflecting tax benefits of debt

Cost of Capital = Cost of Equity (Equity/(Debt + Equity)) + Cost of Borrowing (1-t) (Debt/(Debt + Equity))

Cost of equity based upon bottom-up beta

Weights should be market value weights

What is debt?

- General Rule: Debt generally has the following characteristics:
  - Commitment to make fixed payments in the future
  - The fixed payments are tax deductible
  - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.
- As a consequence, debt should include
  - Any interest-bearing liability, whether short term or long term.
  - Any lease obligation, whether operating or capital.

Hyundai's liabilities…

LIABILITIES AND SHAREHOLDERS' EQUITY	Korean won 2007	2006
	(In thousands)	
CURRENT LIABILITIES:		
Current maturities of debentures and long-term borrowings, net of discounts of ₩298,966 thousand in 2007 (Notes 9 and 22)	₩ 187,341,034	₩ 341,960
Trade accounts and notes payable (Notes 21 and 22)	1,495,173,461	1,179,763,488
Accounts payable-other (Notes 21 and 22)	122,492,217	125,989,605
Advances from customers (Note 17)	8,013,303,994	6,262,761,712
Accrued expenses (Notes 21 and 22)	250,899,632	188,086,233
Income tax payable (Note 18)	455,564,205	167,718,040
Foreign exchange forward contracts (Note 11)	205,986,451	2,267,788
Deferred income tax liabilities (Notes 11 and 18)	-	38,716,339
Withholdings and other current liabilities (Notes 17 and 22)	156,881,303	187,804,932
Total current liabilities	10,887,642,297	8,153,450,097
LONG-TERM LIABILITIES:		
Debentures and long-term borrowings, net of discounts of ₩710,750 thousand in 2006 (Notes 9 and 22)	1,625,627	186,552,277
Accrued severance benefits, net of severance insurance deposits and others of ₩1,079,968,485 thousand in 2007 and ₩941,839,903 thousand in 2006 (Note 10)	110,865,582	193,348,583
Long-term accrued expenses	1,029,342	2,269,234
Deferred income tax liabilities (Notes 11 and 18)	257,968,531	81,371,661
Other long-term liabilities (Note 21)	73,455,854	58,321,740
Total long-term liabilities	444,944,936	521,863,495
Total Liabilities	11,332,587,233	8,675,313,592

Estimating the Cost of Debt

- If the firm has bonds outstanding, and the bonds are traded, the yield to maturity on a long-term, straight (no special features) bond can be used as the interest rate.
- If the firm is rated, use the rating and a typical default spread on bonds with that rating to estimate the cost of debt.
- If the firm is not rated,
  - and it has recently borrowed long term from a bank, use the interest rate on the borrowing or
  - estimate a synthetic rating for the company, and use the synthetic rating to arrive at a default spread and a cost of debt
- The cost of debt has to be estimated in the same currency as the cost of equity and the cash flows in the valuation.

Estimating Synthetic Ratings

- The rating for a firm can be estimated using the financial characteristics of the firm. In its simplest form, the rating can be estimated from the interest coverage ratio

  Interest Coverage Ratio = EBIT / Interest Expenses

- For Hyundai's interest coverage ratio, we used the interest expenses and EBIT from 2007.

  Interest Coverage Ratio = 1751/ 11 = 153.60

- For Kristin Kandy, we used the interest expenses and EBIT from the most recent financial year:

  Interest Coverage Ratio = 500,000/ 85,000 = 5.88

- Amazon.com has negative operating income; this yields a negative interest coverage ratio, which should suggest a D rating. We computed an average interest coverage ratio of 2.82 over the next 5 years.

Interest Coverage Ratios, Ratings and Default Spreads

If Interest Coverage Ratio is		Bond Rating	Default Spread(1/00)`	Spread(1/04)	Spread (6/08)
> 8.50	(>12.50)	AAA	0.20%	0.35%	0.75%
6.50 - 8.50	(9.5-12.5)	AA	0.50%	0.50%	1.00%
5.50 - 6.50	(7.5-9.5)	A+	0.80%	0.70%	1.50%
4.25 - 5.50	(6-7.5)	A	1.00%	0.85%	1.80%
3.00 - 4.25	(4.5-6)	A–	1.25%	1.00%	2.00%
2.50 - 3.00	(3.5-4.5)	BBB	1.50%	1.50%	2.25%
2.25 - 2.50	(3.5 -4)	BB+	1.75%	2.00%	3.00%
2.00 - 2.25	((3-3.5)	BB	2.00%	2.50%	3.50%
1.75 - 2.00	(2.5-3)	B+	2.50%	3.25%	4.75%
1.50 - 1.75	(2-2.5)	B	3.25%	4.00%	6.50%
1.25 - 1.50	(1.5-2)	B –	4.25%	6.00%	8.00%
0.80 - 1.25	(1.25-1.5)	CCC	5.00%	8.00%	10.00%
0.65 - 0.80	(0.8-1.25)	CC	6.00%	10.00%	11.50%
0.20 - 0.65	(0.5-0.8)	C	7.50%	12.00%	12.70%
< 0.20	(<0.5)	D	10.00%	20.00%	20.00%

For Hyundai and Kristin Kandy, I used the interest coverage ratio table for smaller/riskier firms (the numbers in brackets) which yields a lower rating for the same interest coverage ratio.

Estimating the cost of debt for a firm

- The synthetic rating for Hyundai is AAA. Using the 2008 default spread of 0.75%, we estimate a cost of debt of 6.55% (using a riskfree rate of 5% and adding in the country default spread of 0.80%):

Cost of debt = Riskfree rate + Country default spread + Company default spread
=5.00% + 0.80%+ 0.75% = 6.55%

- The synthetic rating for Kristin Kandy is A-. Using the 2004 default spread of 1.00% and a riskfree rate of 4.50%, we estimate a cost of debt of 5.50%.

  Cost of debt = Riskfree rate + Default spread =4.50% + 1.00% = 5.50%

- The synthetic rating for Amazon.com in 2000 was BBB. The default spread for BBB rated bond was 1.50% in 2000 and the treasury bond rate was 6.5%.

  Cost of debt = Riskfree Rate + Default spread = 6.50% + 1.50% = 8.00%

Weights for the Cost of Capital Computation

- The weights used to compute the cost of capital should be the market value weights for debt and equity.
- There is an element of circularity that is introduced into every valuation by doing this, since the values that we attach to the firm and equity at the end of the analysis are different from the values we gave them at the beginning.
- For private companies, neither the market value of equity nor the market value of debt is observable. Rather than use book value weights, you should try
  - Industry average debt ratios for publicly traded firms in the business
  - Target debt ratio (if management has such a target)
  - Estimated value of equity and debt from valuation (through an iterative process)

Estimating Cost of Capital: Amazon.com

- Equity
  - Cost of Equity = 6.50% + 1.60 (4.00%) = 12.90%
  - Market Value of Equity = $ 84/share* 340.79 mil shs = $ 28,626 mil (98.8%)
- Debt
  - Cost of debt = 6.50% + 1.50% (default spread) = 8.00%
  - Market Value of Debt = $ 349 mil (1.2%)
- Cost of Capital

  Cost of Capital = 12.9 % (.988) + 8.00% (1- 0) (.012)) = 12.84%

Estimating Cost of Capital: Hyundai Heavy

- Equity
  - Cost of Equity = 5% + 1.50 (4%) + 0.25 (1.20%) = 11.30%
  - Market Value of Equity =27,740 billion Won (99.3%)
- Debt
  - Pre-tax Cost of debt = 5% + 0.80% + 0.75%= 6.55%
  - Market Value of Debt = 185.58 billion Won (0.7%)
- Cost of Capital

Cost of Capital = 11.30 % (.993) + 6.55% (1- .275) (0.007)) = 11.26%

The book value of equity at Hyundai Heavy is 5,492 billion Won

The book value of debt at Hyundai Heavy is 188 billion Won; Interest expense is 11.4 bil; Average maturity of debt = 3 years

Estimated market value of debt = 11.4 billion (PV of annuity, 3 years, 6.55%) + $ 188 billion/1.0655^3 = 185.58 billion Won

Estimating Cost of Capital: Kristin Kandy

- Equity
  - Cost of Equity = 4.50% + 2.94 (4%) = 16.26%
  - Equity as percent of capital = 70%
- Debt
  - Pre-tax Cost of debt = 4.50% + 1.00% = 5.50%
  - Marginal tax rate = 40%
  - Debt as percent of capital = 30% (Industry average)
- Cost of Capital

  Cost of Capital = 16.26% (.70) + 5.50% (1-.40) (.30) = 12.37%

II. Estimating Cashflows and Growth

Defining Cashflow

Cash flows can be measured to

All claimholders in the firm

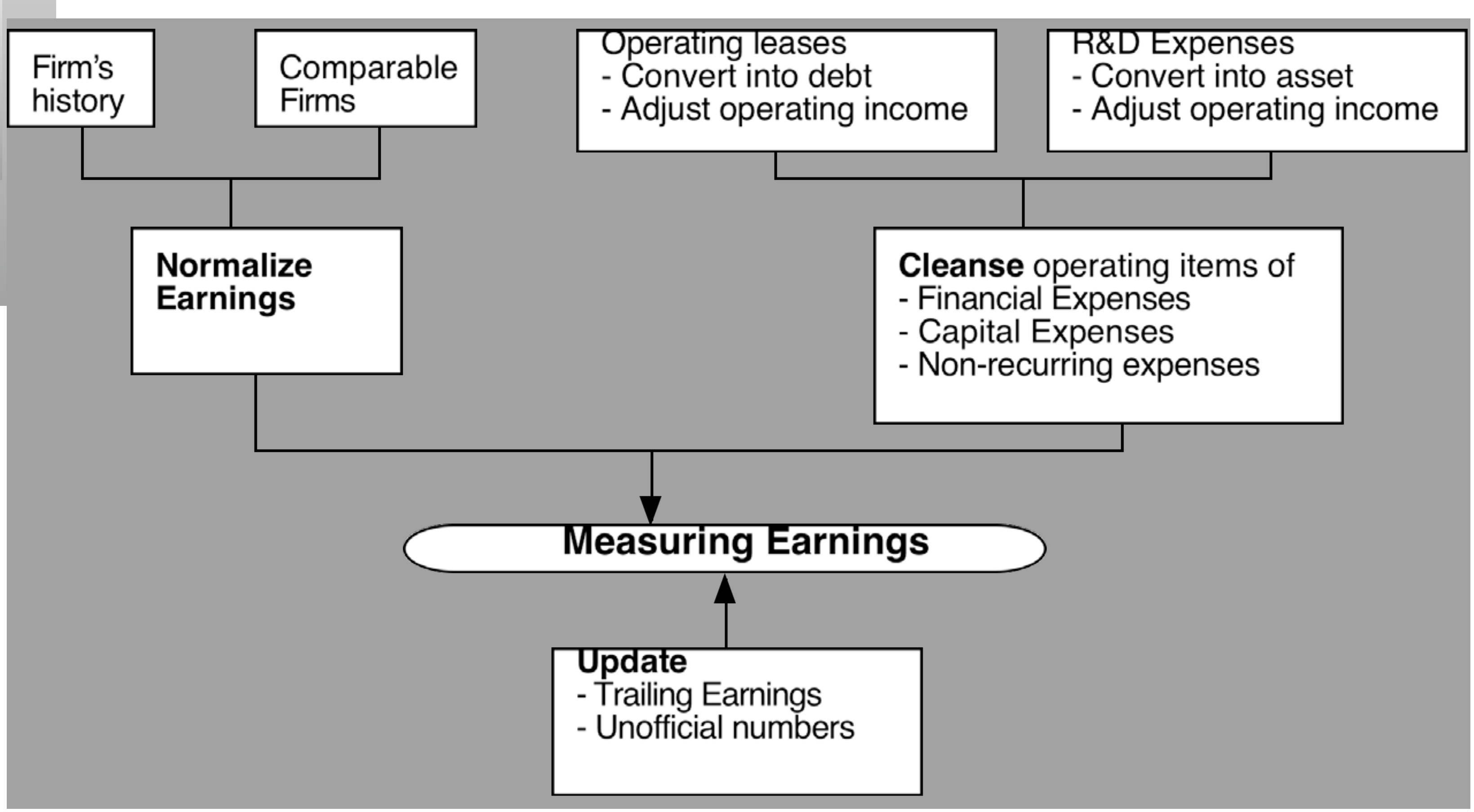
EBIT (1- tax rate)
- (Capital Expenditures - Depreciation)
- Change in non-cash working capital
= Free Cash Flow to Firm (FCFF)

Just Equity Investors

Net Income
- (Capital Expenditures - Depreciation)
- Change in non-cash Working Capital
- (Principal Repaid - New Debt Issues)
- Preferred Dividend

Dividends
+ Stock Buybacks

From Reported to Actual Earnings



Dealing with Operating Lease Expenses

- Operating Lease Expenses are treated as operating expenses in computing operating income. In reality, operating lease expenses should be treated as financing expenses, with the following adjustments to earnings and capital:
- Debt Value of Operating Leases = Present value of Operating Lease Commitments at the pre-tax cost of debt
- When you convert operating leases into debt, you also create an asset to counter it of exactly the same value.
- Adjusted Operating Earnings

  Adjusted Operating Earnings = Operating Earnings + Operating Lease Expenses - Depreciation on Leased Asset

  - As an approximation, this works:

  Adjusted Operating Earnings = Operating Earnings + Pre-tax cost of Debt * PV of Operating Leases.

Operating Leases at The Gap in 2003

- The Gap has conventional debt of about $ 1.97 billion on its balance sheet and its pre-tax cost of debt is about 6%. Its operating lease payments in the 2003 were $978 million and its commitments for the future are below:

Year	Commitment (millions)	Present Value (at 6%)
1	$899.00	$848.11
2	$846.00	$752.94
3	$738.00	$619.64
4	$598.00	$473.67
5	$477.00	$356.44
6&7	$982.50 each year	$1,346.04
Debt Value of leases =		$4,396.85 (Also value of leased asset)

- Debt outstanding at The Gap = $1,970 m + $4,397 m = $6,367 m
- Adjusted Operating Income = Stated OI + OL exp this year - Deprec'n

= $1,012 m + 978 m - 4397 m /7 = $1,362 million (7 year life for assets)

- Approximate OI = $1,012 m + $ 4397 m (.06) = $1,276 m

The Collateral Effects of Treating Operating Leases as Debt

C o nventional Accounting	*Operating Leases Treated as Debt*
Income Statement EBIT& Leases = 1,990 - Op Leases = 978 EBIT = 1,012	*Income Statement* EBIT& Leases = 1,990 - Deprecn: OL= 628 EBIT = 1,362 Interest expense will rise to reflect the conversion of operating leases as debt. Net income should not change.
Balance Sheet Off balance sheet (Not shown as debt or as an asset). Only the conventional debt of $1,970 million shows up on balance sheet	*Balance Sheet* Asset Liability OL Asset 4397 OL Debt 4397 Total debt = 4397 + 1970 = $6,367 million
Cost of capital = 8.20%(7350/9320) + 4% (1970/9320) = 7.31% Cost of equity for The Gap = 8.20% After-tax cost of debt = 4% Market value of equity = 7350	Cost of capital = 8.20%(7350/13717) + 4% (6367/13717) = 6.25%
Return on capital = 1012 (1-.35)/(3130+1970) = 12.90%	Return on capital = 1362 (1-.35)/(3130+6367) = 9.30%

R&D Expenses: Operating or Capital Expenses

- Accounting standards require us to consider R&D as an operating expense even though it is designed to generate future growth. It is more logical to treat it as capital expenditures.
- To capitalize R&D,
  - Specify an amortizable life for R&D (2 - 10 years)
  - Collect past R&D expenses for as long as the amortizable life
  - Sum up the unamortized R&D over the period. (Thus, if the amortizable life is 5 years, the research asset can be obtained by adding up 1/5th of the R&D expense from five years ago, 2/5th of the R&D expense from four years ago...:

Capitalizing R&D Expenses: Cisco in 1999

- R & D was assumed to have a 5-year life.

Year	*R&D Expense*	*Unamortized portion*		*Amortization this year*
1999 (current)	1594.00	1.00	1594.00	
1998	1026.00	0.80	820.80	$205.20
1997	698.00	0.60	418.80	$139.60
1996	399.00	0.40	159.60	$79.80
1995	211.00	0.20	42.20	$42.20
1994	89.00	0.00	0.00	$17.80
Total			$ 3,035.40	$ 484.60

Value of research asset = $ 3,035.4 million

Amortization of research asset in 1998 = $ 484.6 million

Adjustment to Operating Income = $ 1,594 million - 484.6 million = 1,109.4 million

The Effect of Capitalizing R&D

C o nventional Accounting	*R&D treated as capital expenditure*
Income Statement EBIT& R&D = 5,049 - R&D = 1,594 EBIT = 3,455 EBIT (1-t) = 2,246	*Income Statement* EBIT& R&D = 5,049 - Amort: R&D = 485 EBIT = 4,564 (Increase of 1,109) EBIT (1-t) = 2,967 Ignored tax benefit = (1594-485)(.35) = 388 Adjusted EBIT (1-t) = 2967 + 388 = 3354 (Increase of $1,109 million) Net Income will also increase by $1,109 million
Balance Sheet Off balance sheet asset. Book value of equity at $11,722 million is understated because biggest asset is off the books.	*Balance Sheet* Asset Liability R&D Asset 3035 Book Equity +3035 Total Book Equity = 11722+3035 = 14757
Capital Expenditures Conventional net cap ex of $98 million	*Capital Expenditures* Net Cap ex = 98 + 1594 – 485 = 1206
Cash Flows EBIT (1-t) = 2246 - Net Cap Ex = 98 FCFF = 2148	*Cash Flows* EBIT (1-t) = 3354 - Net Cap Ex = 1206 FCFF = 2148
Return on capital = 2246/11722 (no debt) = 19.16%	Return on capital = 3354/14757 = 22.78%

What tax rate?

- The tax rate that you should use in computing the after-tax operating income should be
  - ❑ The effective tax rate in the financial statements (taxes paid/Taxable income)
  - ❑ The tax rate based upon taxes paid and EBIT (taxes paid/EBIT)
  - ❑ The marginal tax rate for the country in which the company operates
  - ❑ The weighted average marginal tax rate across the countries in which the company operates
  - ❑ None of the above
  - ❑ Any of the above, as long as you compute your after-tax cost of debt using the same tax rate

Capital expenditures should include

- Research and development expenses, once they have been re-categorized as capital expenses. The adjusted net cap ex will be

  Adjusted Net Capital Expenditures = Net Capital Expenditures + Current year's R&D expenses - Amortization of Research Asset

- Acquisitions of other firms, since these are like capital expenditures. The adjusted net cap ex will be

  Adjusted Net Cap Ex = Net Capital Expenditures + Acquisitions of other firms - Amortization of such acquisitions

  Two caveats:

  1. Most firms do not do acquisitions every year. Hence, a normalized measure of acquisitions (looking at an average over time) should be used
  2. The best place to find acquisitions is in the statement of cash flows, usually categorized under other investment activities

Cisco's Net Capital Expenditures in 1999

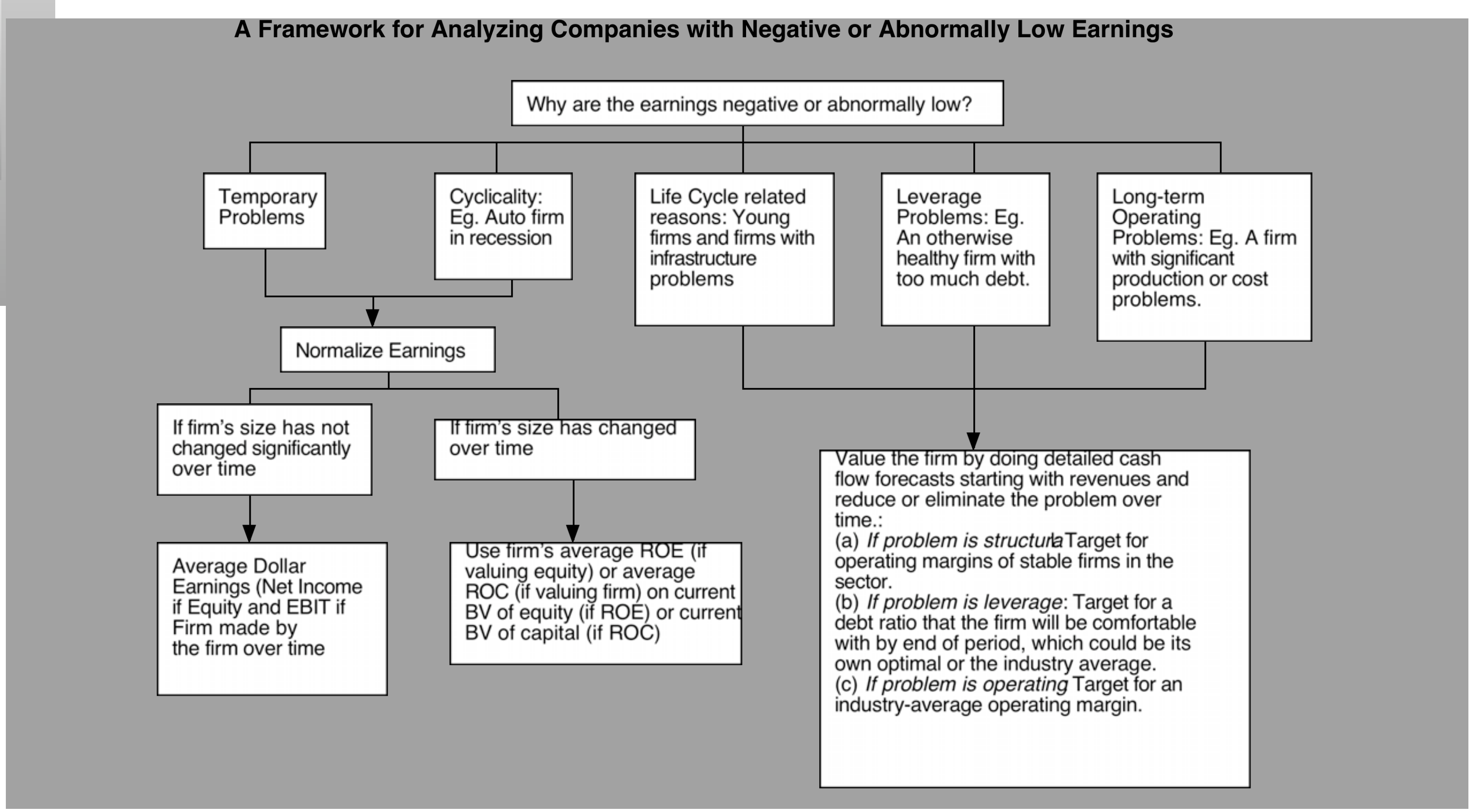
Cap Expenditures (from statement of CF)	= $ 584 mil
- Depreciation (from statement of CF)	= $ 486 mil
Net Cap Ex (from statement of CF)	= $ 98 mil
+ R & D expense	= $ 1,594 mil
- Amortization of R&D	= $ 485 mil
+ Acquisitions	= $ 2,516 mil
Adjusted Net Capital Expenditures	= $3,723 mil

(Amortization was included in the depreciation number)

Working Capital Investments

- In accounting terms, the working capital is the difference between current assets (inventory, cash and accounts receivable) and current liabilities (accounts payables, short term debt and debt due within the next year)
- A cleaner definition of working capital from a cash flow perspective is the difference between <u>non-cash current assets</u> (inventory and accounts receivable) and <u>non-debt current liabilities</u> (accounts payable)
- Any investment in this measure of working capital ties up cash. Therefore, any increases (decreases) in working capital will reduce (increase) cash flows in that period.
- When forecasting future growth, it is important to forecast the effects of such growth on working capital needs, and building these effects into the cash flows.

Dealing with Negative or Abnormally Low Earnings



Normalizing Earnings: Amazon

Year	Revenues	Operating Margin	EBIT	
Tr12m	$1,117	-36.71%	-$410	
1	$2,793	-13.35%	-$373	
2	$5,585	-1.68%	-$94	
3	$9,774	4.16%	$407	
4	$14,661	7.08%	$1,038	
5	$19,059	8.54%	$1,628	
6	$23,862	9.27%	$2,212	
7	$28,729	9.64%	$2,768	
8	$33,211	9.82%	$3,261	
9	$36,798	9.91%	$3,646	
10	$39,006	9.95%	$3,883	
TY(11)	$41,346	10.00%	$4,135	Industry Average

Estimating FCFF: Hyundai Heavy Industries

- EBIT = 1,751 billion Won
- Tax rate = 27.5%
- Net Capital expenditures =Cap Ex - Depreciation = 911 – 392 = 519 billion W
- Change in Working Capital = - 135 billion Won

Estimating FCFF

Current EBIT * (1 - tax rate) =	1751 (1-.275) =	1,269 billion Won
- (Capital Spending - Depreciation)		519 billion Won
- Change in Working Capital		135 billion Won
Current FCFF		615 billion Won

Reinvestment in 2007 = 519 +135 = 654 billion Won

Reinvestment rate = 654/1269 = 51.52%

Estimating FCFF: Amazon.com

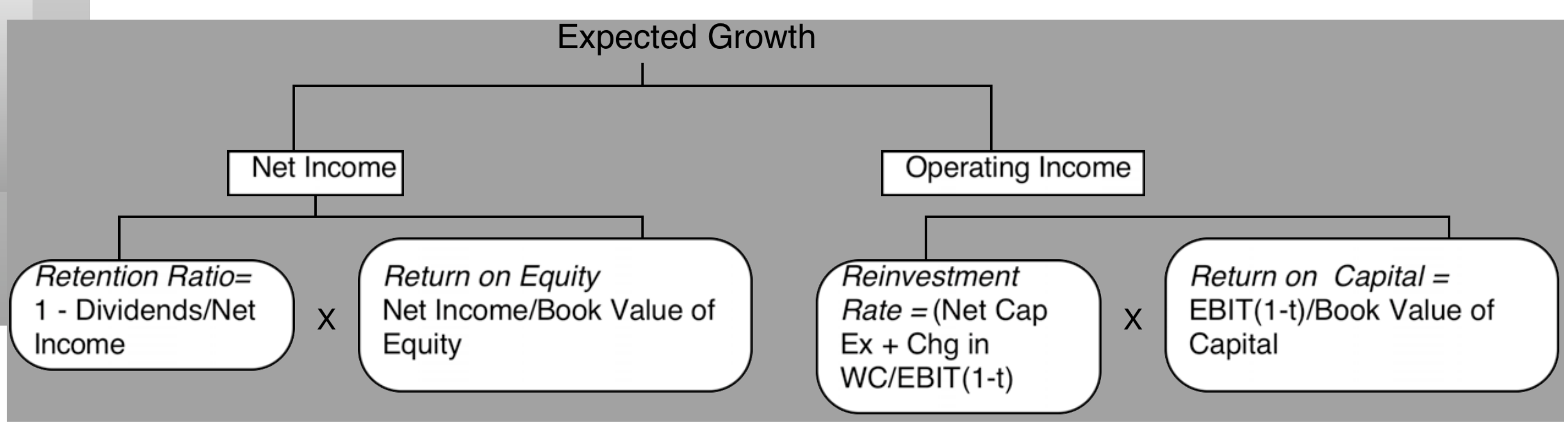
- EBIT (Trailing 1999) = -$ 410 million
- Tax rate used = 0% (Assumed Effective = Marginal)
- Capital spending (Trailing 1999) = $ 243 million
- Depreciation (Trailing 1999) = $ 31 million
- Non-cash Working capital Change (1999) = - 80 million
- Estimating FCFF (1999)

Current EBIT * (1 - tax rate) = - 410 (1-0)	=	- $410 million
- (Capital Spending - Depreciation)	=	$212 million
- Change in Working Capital	=	-$ 80 million
Current FCFF	=	- $542 million

Growth in Earnings

- Look at the past
  - The historical growth in earnings per share is usually a good starting point for growth estimation
- Look at what others are estimating
  - Analysts estimate growth in earnings per share for many firms. It is useful to know what their estimates are.
- Look at fundamentals
  - Ultimately, all growth in earnings can be traced to two fundamentals - how much the firm is investing in new projects, and what returns these projects are making for the firm.

Fundamental Growth when Returns are stable



Measuring Return on Capital (Equity)

Adjust EBIT for
a. Extraordinary or one-time expenses or income
b. Operating leases and R&D
c. Cyclicality in earnings (Normalize)
d. Acquisition Debris (Goodwill amortization etc.)

Use a marginal tax rate to be safe. A high ROC created by paying low effective taxes is not sustainable

$$\text{ROC} = \frac{\text{EBIT (1- tax rate)}}{\text{Book Value of Equity + Book value of debt - Cash}}$$

Adjust book equity for
1. Capitalized R&D
2. Acquisition Debris (Goodwill)

Adjust book value of debt for
a. Capitalized operating leases

Use end of prior year numbers or average over the year but be consistent in your application

Expected Growth Estimate: Hyundai Heavy

EBIT (1-t) in 2007:
1,269 million

Reinevestment in 2007
Net Cap Ex = 519
Chg in WC = 135
Total = 654

EBIT (1-t) in year 2007
1,269 million

Invested Capital in 2006	
BV of Debt	187
+ BV of Equity	4479
- Cash	1276
Invested Capital = 3390	

Reinvestment Rate = Reinvestment/ EBIT (1-t)
= 654/1269 = 51/5%

X

Return on Capital = EBIT (1-t)/ Invested Capital
=1269/3390 = 37.45%

= 19.3%

Normalized Values

Average reinvestment rate over last 5 years
50%

X

Lower return on capital reflecting increasing scale
30%

= 15%

Fundamental Growth when return on equity (capital) is changing

- When the return on equity or capital is changing, there will be a second component to growth, positive if the return is increasing and negative if the return is decreasing. If ROC_t is the return on capital in period t and ROC_{t+1} is the return on capital in period t+1, the expected growth rate in operating income will be:

  Expected Growth Rate $= ROC_{t+1}$ * Reinvestment rate

  $$+(ROC_{t+1} - ROC_t) / ROC_t$$

- For example, assume that you have a firm that is generating a return on capital of 8% on its existing assets and expects to increase this return to 10% next year. The efficiency growth for this firm is

  Efficiency growth = (10% -8%)/ 8% = 25%

  Thus, if this firm has a reinvestment rate of 50% and makes a 10% return on capital on its new investments as well, its total growth next year will be 30%

  Growth rate = .50 * 10% + 25% = 30%

  The key difference is that growth from new investments is sustainable whereas returns from efficiency are short term (or transitory).

Revenue Growth and Operating Margins

- With negative operating income and a negative return on capital, the fundamental growth equation is of little use for Amazon.com
- For Amazon, the effect of reinvestment shows up in revenue growth rates and changes in expected operating margins:

Expected Revenue Growth in $ = Reinvestment (in $ terms) * (Sales/ Capital)

- The effect on expected margins is more subtle. Amazon's reinvestments (especially in acquisitions) may help create barriers to entry and other competitive advantages that will ultimately translate into high operating margins and high profits.

Growth in Revenues, Earnings and Reinvestment: Amazon

Year	Revenue Growth	Chg in Revenue	Reinvestment	Chg Rev/ Chg Reinvestment	ROC
1	150.00%	$1,676	$559	3.00	-76.62%
2	100.00%	$2,793	$931	3.00	-8.96%
3	75.00%	$4,189	$1,396	3.00	20.59%
4	50.00%	$4,887	$1,629	3.00	25.82%
5	30.00%	$4,398	$1,466	3.00	21.16%
6	25.20%	$4,803	$1,601	3.00	22.23%
7	20.40%	$4,868	$1,623	3.00	22.30%
8	15.60%	$4,482	$1,494	3.00	21.87%
9	10.80%	$3,587	$1,196	3.00	21.19%
10	6.00%	$2,208	$736	3.00	20.39%

Assume that firm can earn high returns because of established economies of scale.

III. The Tail that wags the dog… Terminal Value

Getting Closure in Valuation

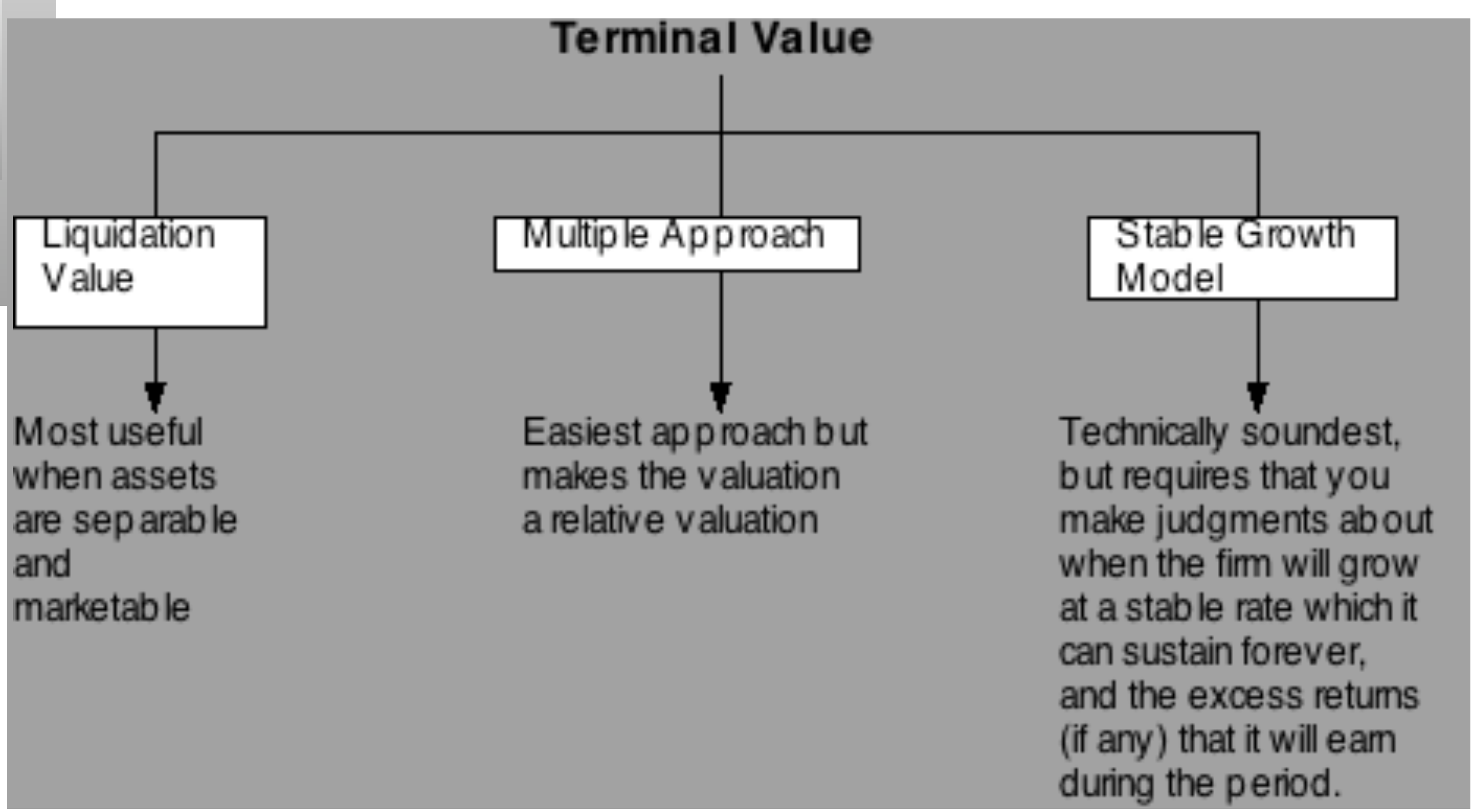
- A publicly traded firm potentially has an infinite life. The value is therefore the present value of cash flows forever.

$$\text{Value} = \sum_{t=1}^{t=\infty} \frac{CF_t}{(1+r)^t}$$

- Since we cannot estimate cash flows forever, we estimate cash flows for a "growth period" and then estimate a terminal value, to capture the value at the end of the period:

$$\text{Value} = \sum_{t=1}^{t=N} \frac{CF_t}{(1+r)^t} + \frac{\text{Terminal Value}}{(1+r)^N}$$

Ways of Estimating Terminal Value



Stable Growth and Terminal Value

- When a firm's cash flows grow at a "constant" rate forever, the present value of those cash flows can be written as:

  Value = Expected Cash Flow Next Period / (r - g)

  where,

  r = Discount rate (Cost of Equity or Cost of Capital)

  g = Expected growth rate
- This "constant" growth rate is called a <u>stable growth rate</u> and <u>cannot be higher than the growth rate of the economy</u> in which the firm operates.
- While companies can maintain high growth rates for extended periods, they will all approach "stable growth" at some point in time.

1. How high can the stable growth rate be?

- The stable growth rate cannot exceed the growth rate of the economy but it can be set lower.
  - If you assume that the economy is composed of high growth and stable growth firms, the growth rate of the latter will probably be lower than the growth rate of the economy.
  - The stable growth rate can be negative. The terminal value will be lower and you are assuming that your firm will disappear over time.
  - If you use nominal cashflows and discount rates, the growth rate should be nominal in the currency in which the valuation is denominated.
- One simple proxy for the nominal growth rate of the economy is the riskfree rate.
  - Riskfree rate = Expected inflation + Expected Real Interest Rate
  - Nominal growth rate in economy = Expected Inflation + Expected Real Growth

2. When will the firm reach stable growth?

- Size of the firm
  - Success usually makes a firm larger. As firms become larger, it becomes much more difficult for them to maintain high growth rates
- Current growth rate
  - While past growth is not always a reliable indicator of future growth, there is a correlation between current growth and future growth. Thus, a firm growing at 30% currently probably has higher growth and a longer expected growth period than one growing 10% a year now.
- Barriers to entry and differential advantages
  - Ultimately, high growth comes from high project returns, which, in turn, comes from barriers to entry and differential advantages.
  - The question of how long growth will last and how high it will be can therefore be framed as a question about what the barriers to entry are, how long they will stay up and how strong they will remain.

3. What else should change in stable growth?

- In stable growth, firms should have the characteristics of other stable growth firms. In particular,
  - The risk of the firm, as measured by beta and ratings, should reflect that of a stable growth firm.
    - Beta should move towards one
    - The cost of debt should reflect the safety of stable firms (BBB or higher)
  - The debt ratio of the firm might increase to reflect the larger and more stable earnings of these firms.
    - The debt ratio of the firm might moved to the optimal or an industry average
    - If the managers of the firm are deeply averse to debt, this may never happen
  - The return on capital generated on investments should move to sustainable levels, relative to both the sector and the company's own cost of capital.

4. What excess returns will you generate in stable growth and why does it matter?

- Strange though this may seem, the terminal value is not as much a function of stable growth as it is a function of what you assume about excess returns in stable growth.
- The key connecting link is the reinvestment rate that you have in stable growth, which is a function of your return on capital:

  Reinvestment Rate = Stable growth rate/ Stable ROC

  The terminal value can be written in terms of ROC as follows:

  Terminal Value = $EBIT_{n+1}$ (1-t) (1 – g/ ROC)/ (Cost of capital – g)
- In the scenario where you assume that a firm earns a return on capital equal to its cost of capital in stable growth, the terminal value will not change as the growth rate changes.
- If you assume that your firm will earn positive (negative) excess returns in perpetuity, the terminal value will increase (decrease) as the stable growth rate increases.

Hyundai and Amazon.com: Stable Growth Inputs

	High Growth	Stable Growth
■ Hyundai Heavy		
• Beta	1.50	1.20
• Debt Ratio	0.7%	10%
• Return on Capital	30%	9.42%
• Cost of Capital	11.26%	9.42%
• Expected Growth Rate	15%	5%
• Reinvestment Rate	50%	5%/9.42% = 53.1%
■ Amazon.com		
• Beta	1.60	1.00
• Debt Ratio	1.20%	15%
• Return on Capital	Negative	20%
• Expected Growth Rate	NMF	6%
• Reinvestment Rate	>100%	6%/20% = 30%

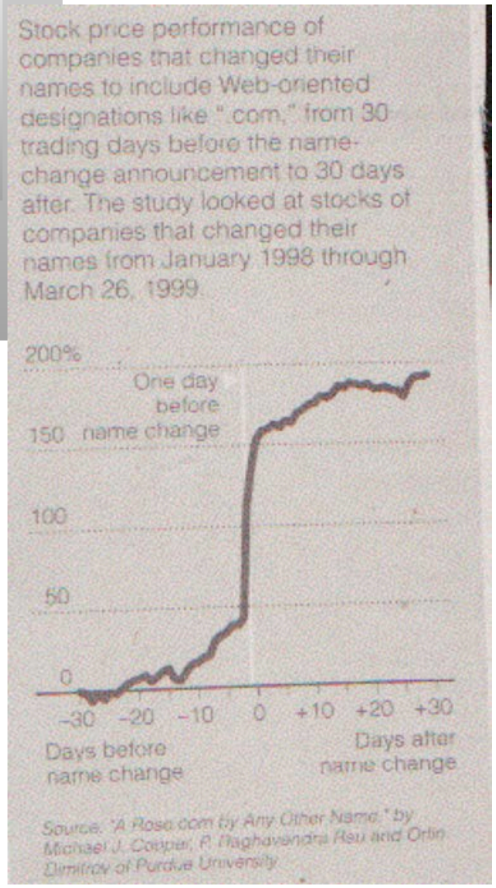
Hyundai: Terminal Value and Growth

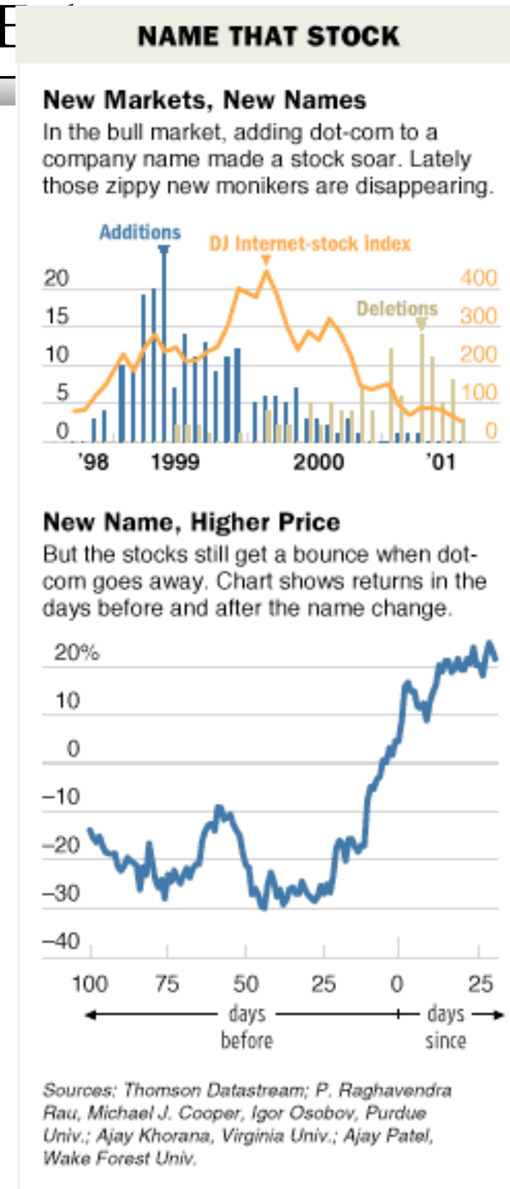
Growth Rate	Reinvestment Rate	FCFF	Terminal value
0%	0.00%	₩2,681	₩28,471
1%	10.62%	₩2,396	₩28,471
2%	21.24%	₩2,112	₩28,471
3%	31.86%	₩1,827	₩28,471
4%	42.48%	₩1,542	₩28,471
5%	53.10%	₩1,258	₩28,471

As growth increases, value does not change. Why?
Under what conditions will value increase as growth increases?
Under what conditions will value decrease as growth increases?

Value Enhancement: Back to Basics

Price Enhancement versus Value E

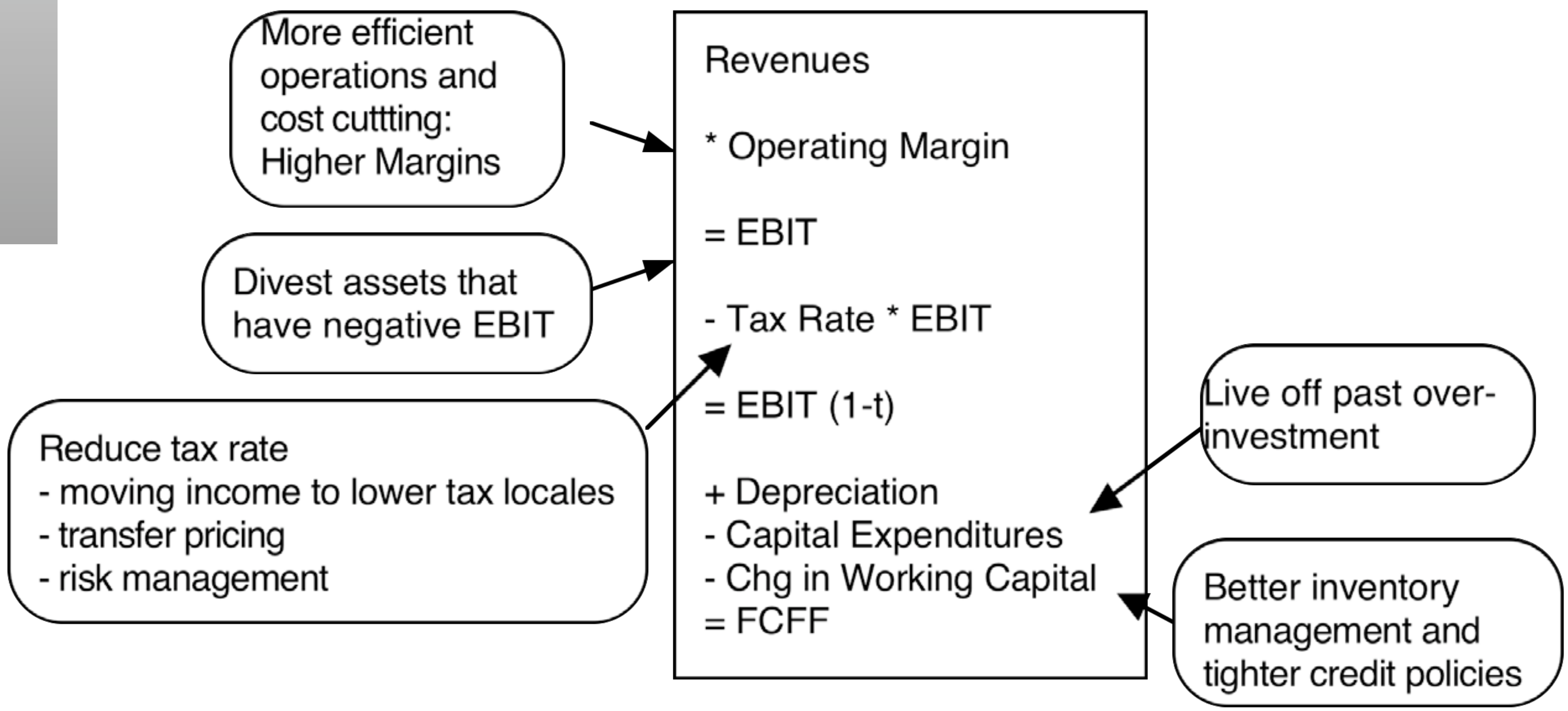




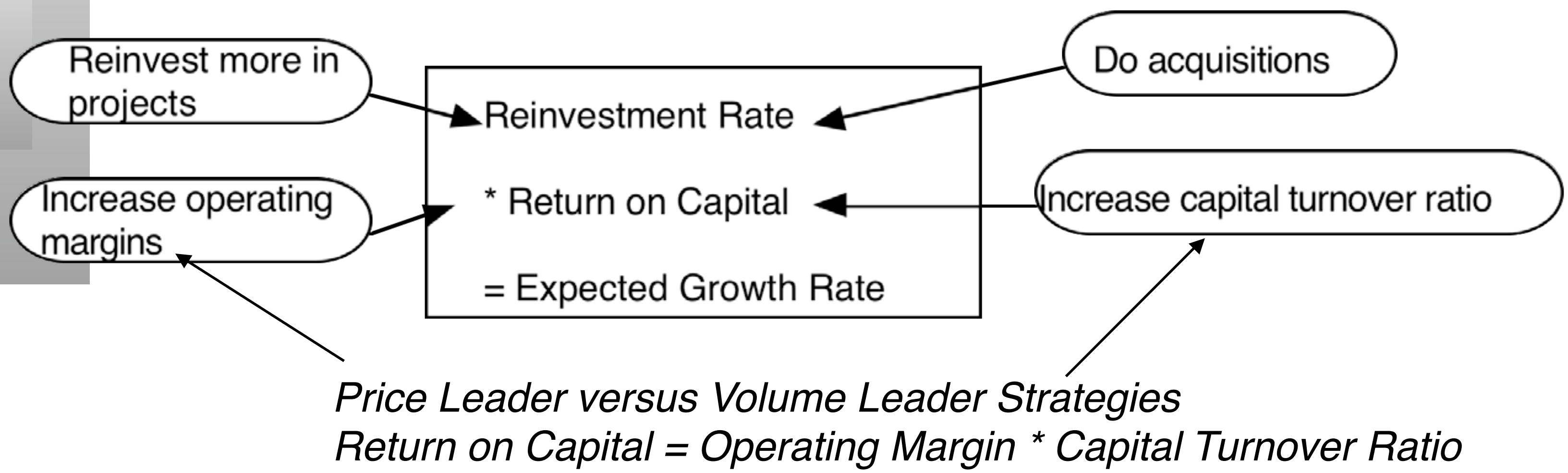
The Paths to Value Creation

- Using the DCF framework, there are four basic ways in which the value of a firm can be enhanced:
  - The cash flows from existing assets to the firm can be increased, by either
    - increasing after-tax earnings from assets in place or
    - reducing reinvestment needs (net capital expenditures or working capital)
  - The expected growth rate in these cash flows can be increased by either
    - Increasing the rate of reinvestment in the firm
    - Improving the return on capital on those reinvestments
  - The length of the high growth period can be extended to allow for more years of high growth.
  - The cost of capital can be reduced by
    - Reducing the operating risk in investments/assets
    - Changing the financial mix
    - Changing the financing composition

Value Creation 1: Increase Cash Flows from Assets in Place

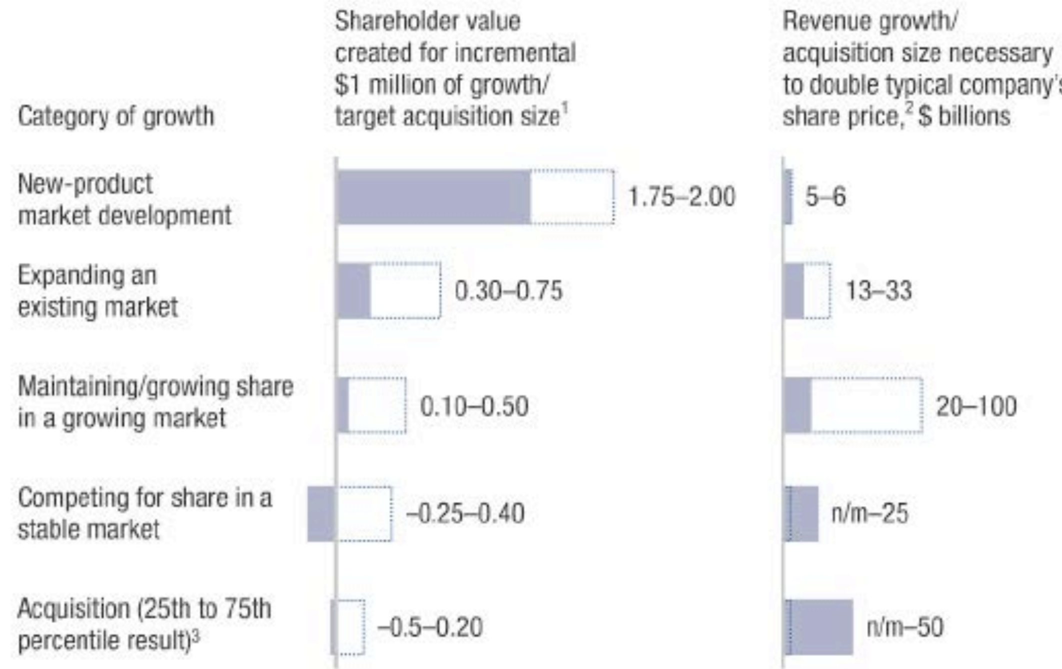


Value Creation 2: Increase Expected Growth

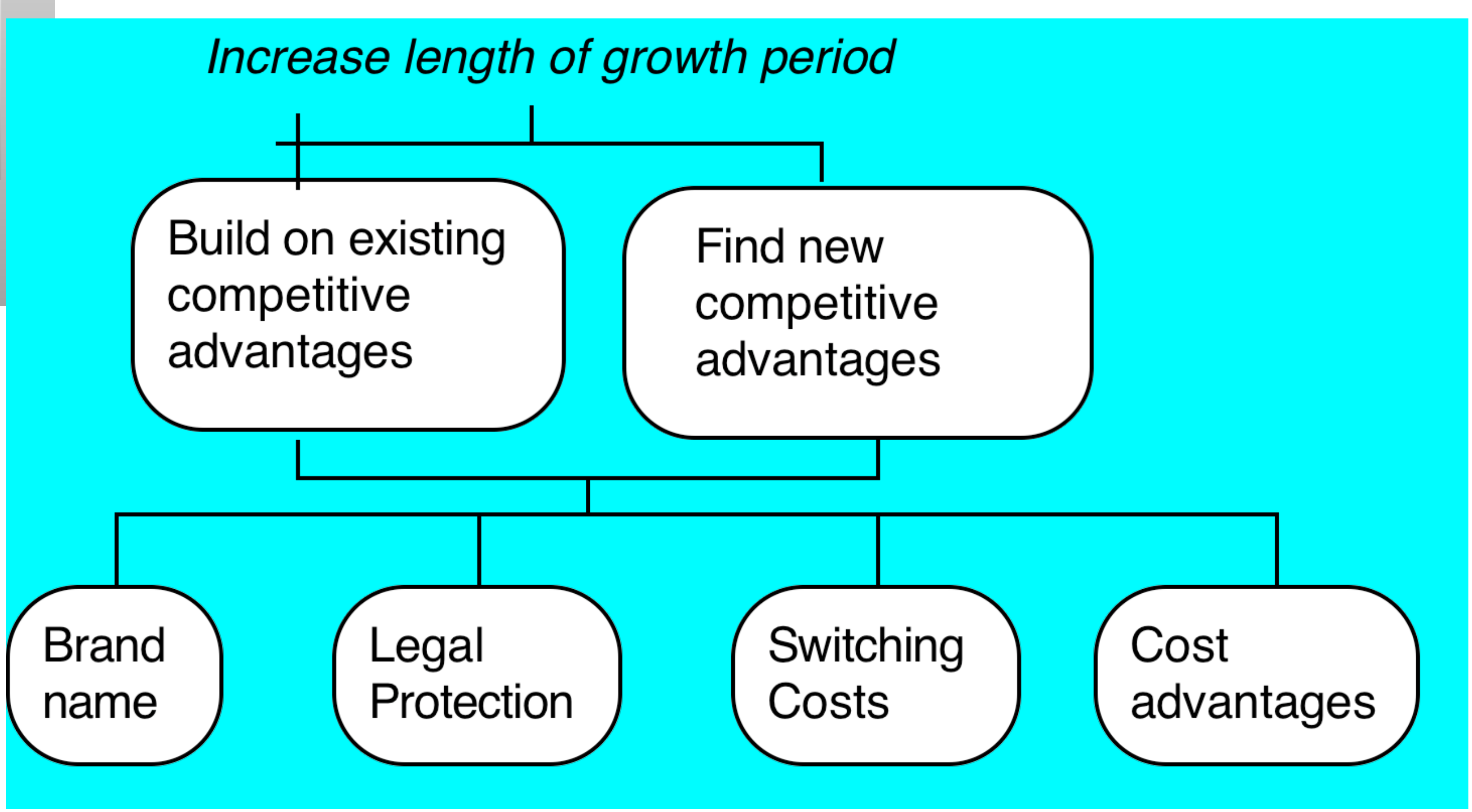


Value Creating Growth… Evaluating the Alternatives..

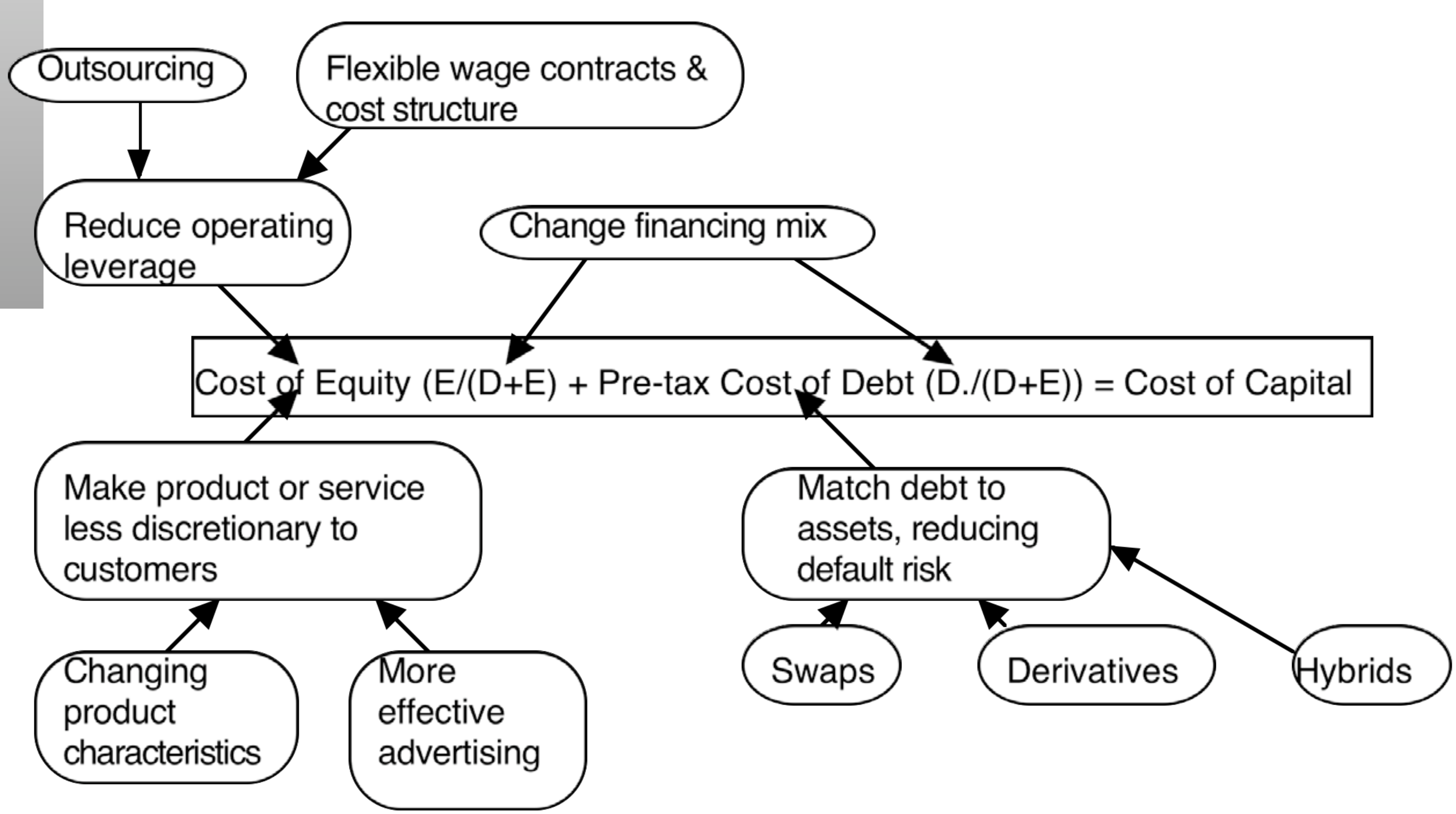
Modes of organic growth vary in value creation intensity—consumer goods industry



III. Building Competitive Advantages: Increase length of the growth period



Value Creation 4: Reduce Cost of Capital



Hyundai's Optimal Financing Mix

Debt Ratio	Beta	Cost of Equity	Bond Rating	Interest rate on debt	Tax Rate	Cost of Debt (after-tax)	WACC	Firm Value (G)
0%	1.49	11.27%	AAA	6.55%	27.50%	4.75%	11.27%	$26,470
10%	1.61	11.77%	A	7.60%	27.50%	5.51%	11.15%	$27,021
20%	1.76	12.41%	B	12.30%	27.50%	8.92%	11.71%	$24,648
30%	1.96	13.23%	CC	17.30%	27.04%	12.62%	13.05%	$20,313
40%	2.30	14.66%	C	18.50%	18.90%	15.00%	14.80%	$16,437
50%	2.76	16.59%	C	18.50%	15.12%	15.70%	16.15%	$14,278
60%	3.47	19.57%	D	19.80%	11.74%	17.48%	18.31%	$11,727
70%	4.63	24.43%	D	19.80%	10.06%	17.81%	19.79%	$10,414
80%	6.94	34.14%	D	19.80%	8.80%	18.06%	21.27%	$9,340
90%	13.88	63.28%	D	19.80%	7.83%	18.25%	22.75%	$8,445

IV. Loose Ends in Valuation: From firm value to value of equity per share

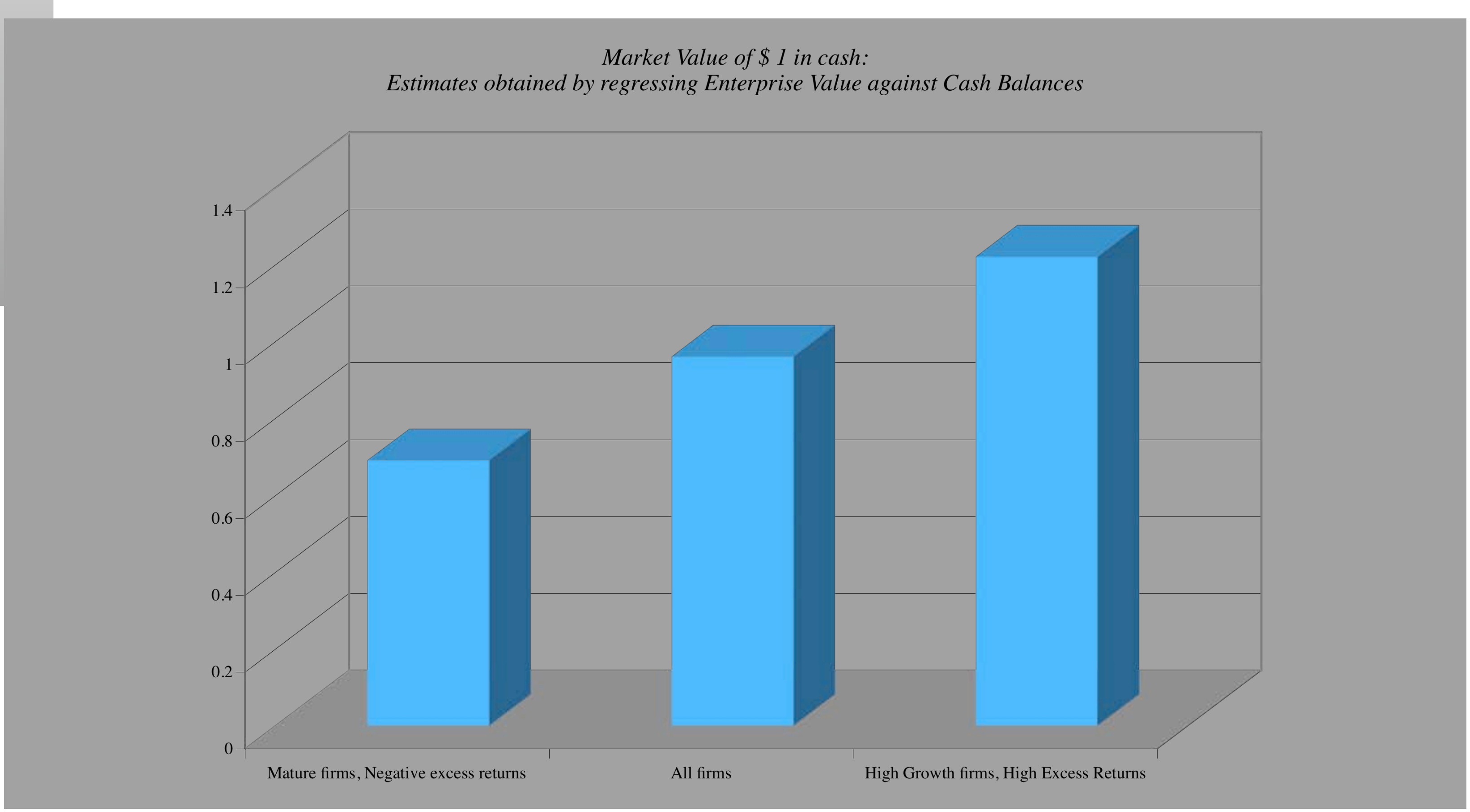
But what comes next?

Value of Operating Assets	Since this is a discounted cashflow valuation, should there be a real option premium?
+ Cash and Marketable Securities	Operating versus Non-opeating cash Should cash be discounted for earning a low return?
+ Value of Cross Holdings	How do you value cross holdings in other companies? What if the cross holdings are in private businesses?
+ Value of Other Assets	What about other valuable assets? How do you consider under utlilized assets?
Value of Firm	Should you discount this value for opacity or complexity? How about a premium for synergy? What about a premium for intangibles (brand name)?
- Value of Debt	What should be counted in debt? Should you subtract book or market value of debt? What about other obligations (pension fund and health care? What about contingent liabilities? What about minority interests?
= Value of Equity	Should there be a premium/discount for control? Should there be a discount for distress
- Value of Equity Options	What equity options should be valued here (vested versus non-vested)? How do you value equity options?
= Value of Common Stock	Should you divide by primary or diluted shares?
/ Number of shares	
= Value per share	Should there be a discount for illiquidity/ marketability? Should there be a discount for minority interests?

1. An Exercise in Cash Valuation

	Company A	*Company B*	*Company C*
Enterprise Value	$ 1 billion	$ 1 billion	$ 1 billion
Cash	$ 100 mil	$ 100 mil	$ 100 mil
Return on Capital	10%	5%	22%
Cost of Capital	10%	10%	12%
Trades in	US	US	Indonesia

Cash: Discount or Premium?



Cash and Trouble?

Company Name	Primary Industry	ROIC	Cash/ Value
Able C&C Co. Ltd.	Personal Products	0.49%	38.74%
Varo Vision Co Ltd	-	0.85%	76.99%
Raygen Co. Ltd.	Semiconductors	1.12%	38.39%
Kodicom Co. Ltd.	Consumer Electronics	2.62%	53.35%
Kukyoung Glass Industries	Building Products	3.10%	38.75%
DASAN Networks Inc.	Communications Equipment	3.45%	49.05%
Tellord Co. Ltd.	-	6.89%	45.47%
FRTEK Co. Ltd	Communications Equipment	6.98%	45.51%
Ilsung Construction Co., Ltd.	Construction and Engineering	7.29%	89.49%
H&T Co., Ltd.	Computer Storage and Peripherals	7.76%	42.92%
Feelingk Co. Ltd.	Internet Software and Services	8.38%	46.79%
Duck Yang Industry Co. Ltd.	Auto Parts and Equipment	8.84%	92.63%
Sewoo Global Co. Ltd.	Commodity Chemicals	9.23%	43.88%
D&T, Inc.	IT Consulting and Other Services	9.51%	39.31%

2. Dealing with Holdings in Other firms

- Holdings in other firms can be categorized into
  - Minority passive holdings, in which case only the dividend from the holdings is shown in the balance sheet
  - Minority active holdings, in which case the share of equity income is shown in the income statements
  - Majority active holdings, in which case the financial statements are consolidated.
- We tend to be sloppy in practice in dealing with cross holdings. After valuing the operating assets of a firm, using consolidated statements, it is common to add on the balance sheet value of minority holdings (which are in book value terms) and subtract out the minority interests (again in book value terms), representing the portion of the consolidated company that does not belong to the parent company.

How to value holdings in other firms.. In a perfect world..

- In a perfect world, we would strip the parent company from its subsidiaries and value each one separately. The value of the combined firm will be
  - Value of parent company + Proportion of value of each subsidiary
- To do this right, you will need to be provided detailed information on each subsidiary to estimated cash flows and discount rates.

Two compromise solutions…

- The market value solution: When the subsidiaries are publicly traded, you could use their traded market capitalizations to estimate the values of the cross holdings. You do risk carrying into your valuation any mistakes that the market may be making in valuation.
- The relative value solution: When there are too many cross holdings to value separately or when there is insufficient information provided on cross holdings, you can convert the book values of holdings that you have on the balance sheet (for both minority holdings and minority interests in majority holdings) by using the average price to book value ratio of the sector in which the subsidiaries operate.

Hyundai's Cross Holdings

	Cross holding	*% of holding*	*Total Market Cap*	*Value of holding*	*Book Value*	*P/Book (Sector)*
Public	Hyundai Merchant Marine	17.60%	4806.00	845.86		
	Hyundai Motors	3.46%	17540.00	606.88		
	Hyundai Elevator	2.16%	688.00	14.86		
	Hyundai Corp	0.36%	602.00	2.17		
	Others	?	?	84.20		
Private	Hyundai Oil Bank	19.87%	1825.77	362.78	329.80	1.10
	Hyundai Samho	94.92%	2026.23	1923.30	1068.50	1.80
	Hyundai Finance	67.49%	143.75	97.02	88.20	1.10
	Value of Cross holdings			3937.07		

3. Other Assets that have not been counted yet..

- **Unutilized assets**: If you have assets or property that are not being utilized (vacant land, for example), you have not valued it yet. You can assess a market value for these assets and add them on to the value of the firm.
- **Overfunded pension plans**: If you have a defined benefit plan and your assets exceed your expected liabilities, you could consider the over funding with two caveats:
  - Collective bargaining agreements may prevent you from laying claim to these excess assets.
  - There are tax consequences. Often, withdrawals from pension plans get taxed at much higher rates.

Do not double count an asset. If you count the income from an asset in your cashflows, you cannot count the market value of the asset in your value.

4. A Discount for Complexity: An Experiment

	Company A	*Company B*
Operating Income	$ 1 billion	$ 1 billion
Tax rate	40%	40%
ROIC	10%	10%
Expected Growth	5%	5%
Cost of capital	8%	8%
Business Mix	Single Business	Multiple Businesses
Holdings	Simple	Complex
Accounting	Transparent	Opaque

- *Which firm would you value more highly?*

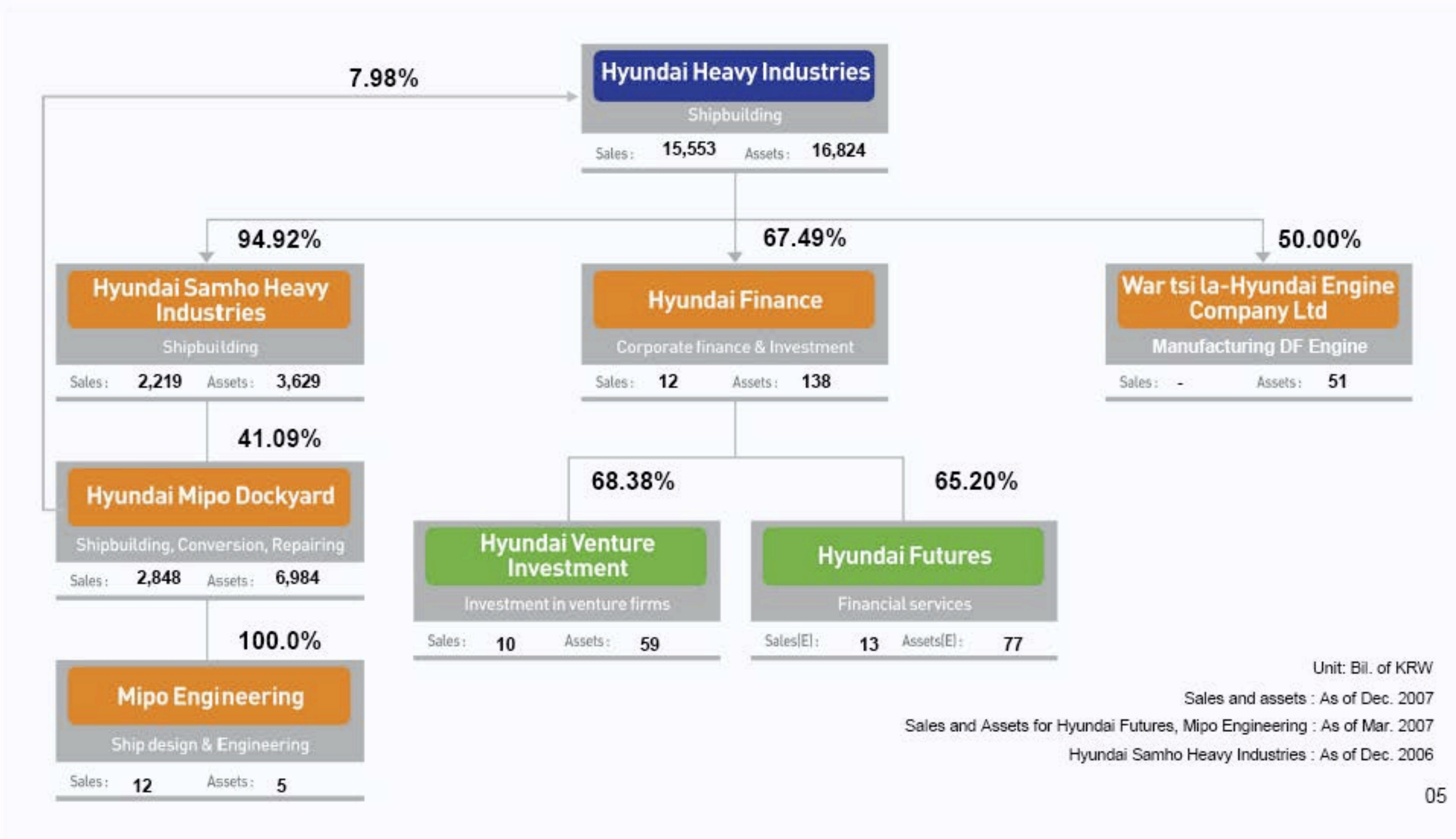
Measuring Complexity: Volume of Data in Financial Statements

Company	*Number of pages in last 10Q*	*Number of pages in last 10K*
General Electric	65	410
Microsoft	63	218
Wal-mart	38	244
Exxon Mobil	86	332
Pfizer	171	460
Citigroup	252	1026
Intel	69	215
AIG	164	720
Johnson & Johnson	63	218
IBM	85	353

Measuring Complexity: A Complexity Score

Item	Factors	Follow-up Question	Answer	Weighting factor	Gerdau Score	GE Score
Operating Income	1. Multiple Businesses	Number of businesses (with more than 10% of revenues) =	1	2.00	2	30
	2. One-time income and expenses	Percent of operating income =	10%	10.00	1	0.8
	3. Income from unspecified sources	Percent of operating income =	0%	10.00	0	1.2
	4. Items in income statement that are volatile	Percent of operating income =	15%	5.00	0.75	1
Tax Rate	1. Income from multiple locales	Percent of revenues from non-domestic locales =	70%	3.00	2.1	1.8
	2. Different tax and reporting books	Yes or No	No	Yes=3	0	3
	3. Headquarters in tax havens	Yes or No	No	Yes=3	0	0
	4. Volatile effective tax rate	Yes or No	Yes	Yes=2	2	0
Capital Expenditures	1. Volatile capital expenditures	Yes or No	Yes	Yes=2	2	2
	2. Frequent and large acquisitions	Yes or No	Yes	Yes=4	4	4
	3. Stock payment for acquisitions and investments	Yes or No	No	Yes=4	0	4
Working capital	1. Unspecified current assets and current liabilities	Yes or No	No	Yes=3	0	0
	2. Volatile working capital items	Yes or No	Yes	Yes=2	2	2
Expected Growth rate	1. Off-balance sheet assets and liabilities (operating leases and R&D)	Yes or No	No	Yes=3	0	3
	2. Substantial stock buybacks	Yes or No	No	Yes=3	0	3
	3. Changing return on capital over time	Is your return on capital volatile?	Yes	Yes=5	5	5
	4. Unsustainably high return	Is your firm's ROC much higher than industry average?	No	Yes=5	0	0
Cost of capital	1. Multiple businesses	Number of businesses (more than 10% of revenues) =	1	1.00	1	20
	2. Operations in emerging markets	Percent of revenues=	50%	5.00	2.5	2.5
	3. Is the debt market traded?	Yes or No	No	No=2	2	0
	4. Does the company have a rating?	Yes or No	Yes	No=2	0	0
	5. Does the company have off-balance sheet debt?	Yes or No	No	Yes=5	0	5
No-operating assets	Minority holdings as percent of book assets	Minority holdings as percent of book assets	0%	20.00	0	0.8
Firm to Equity value	Consolidation of subsidiaries	Minority interest as percent of book value of equity	63%	20.00	12.6	1.2
Per share value	Shares with different voting rights	Does the firm have shares with different voting rights?	Yes	Yes = 10	10	0
	Equity options outstanding	Options outstanding as percent of shares	0%	10.00	0	0.25
		Complexity Score =			48.95	90.55

Hyundai: An Enigma wrapped in a Mystery



Dealing with Complexity

In Discounted Cashflow Valuation

- The Aggressive Analyst: Trust the firm to tell the truth and value the firm based upon the firm's statements about their value.
- The Conservative Analyst: Don't value what you cannot see.
- The Compromise: Adjust the value for complexity
  - Adjust cash flows for complexity
  - Adjust the discount rate for complexity
  - Adjust the expected growth rate/ length of growth period
  - Value the firm and then discount value for complexity

In relative valuation

In a relative valuation, you may be able to assess the price that the market is charging for complexity:

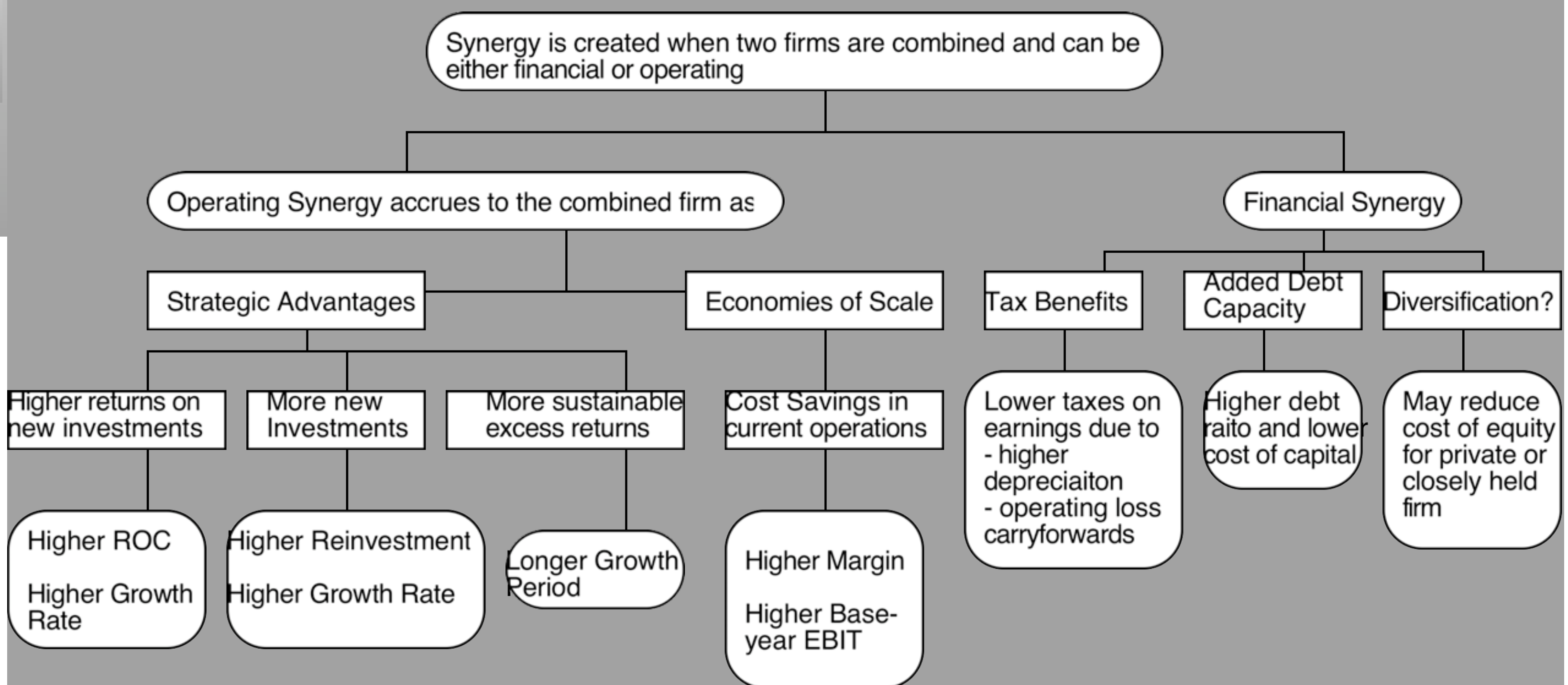
With the hundred largest market cap firms, for instance:

PBV = 0.65 + 15.31 ROE – 0.55 Beta + 3.04 Expected growth rate – 0.003 # Pages in 10K

5. The Value of Synergy

- Synergy can be valued. In fact, if you want to pay for it, it should be valued.
- To value synergy, you need to answer two questions:
  - (a) What **form** is the synergy expected to take? Will it **reduce costs** as a percentage of sales and increase profit margins (as is the case when there are economies of scale)? Will it **increase future growth** (as is the case when there is increased market power)?)
  - (b) **When can the synergy be reasonably expected to start** affecting cashflows? (Will the gains from synergy show up instantaneously after the takeover? If it will take time, when can the gains be expected to start showing up?)
- If you cannot answer these questions, you need to go back to the drawing board…

Sources of Synergy



Valuing Synergy

(1) the firms involved in the merger are **valued independently**, by discounting expected cash flows to each firm at the weighted average cost of capital for that firm.

(2) the **value of the combined firm, with no synergy**, is obtained by adding the values obtained for each firm in the first step.

(3) The **effects of synergy are built into expected growth rates and cashflows**, and the combined firm is re-valued with synergy.

Value of Synergy = Value of the combined firm, with synergy - Value of the combined firm, without synergy

Valuing Synergy: P&G + Gillette

	P&G	Gillette	Piglet: No Synergy	Piglet: Synergy	
Free Cashflow to Equity	$5,864.74	$1,547.50	$7,412.24	$7,569.73	Annual operating expenses reduced by $250 million
Growth rate for first 5 years	12%	10%	11.58%	12.50%	Slighly higher growth rate
Growth rate after five years	4%	4%	4.00%	4.00%	
Beta	0.90	0.80	0.88	0.88	
Cost of Equity	7.90%	7.50%	7.81%	7.81%	Value of synergy
Value of Equity	$221,292	$59,878	$281,170	$298,355	**$17,185**

6. Brand name, great management, superb product …Are we short changing the intangibles?

- There is often a temptation to add on premiums for intangibles. Among them are
  - Brand name
  - Great management
  - Loyal workforce
  - Technological prowess
- There are two potential dangers:
  - For some assets, the value may already be in your value and adding a premium will be double counting.
  - For other assets, the value may be ignored but incorporating it will not be easy.

Categorizing Intangibles

	Independent and Cash flow generating intangibles	*Not independent and cash flow generating to the firm*	*No cash flows now but potential for cashflows in future*
Examples	Copyrights, trademarks, licenses, franchises, professional practices (medical, dental)	Brand names, Quality and Morale of work force, Technological expertise, Corporate reputation	Undeveloped patents, operating or financial flexibility (to expand into new products/markets or abandon existing ones)
Valuation approach	Estimate expected cashflows from the product or service and discount back at appropriate discount rate.	• Compare DCF value of firm with intangible with firm without (if you can find one) • Assume that all excess returns of firm are due to intangible. • Compare multiples at which firm trades to sector averages.	Option valuation • Value the undeveloped patent as an option to develop the underlying product. • Value expansion options as call options • Value abandonment options as put options.
Challenges	• Life is usually finite and terminal value may be small. • Cashflows and value may be person dependent (for professional practices)	With multiple intangibles (brand name and reputation for service), it becomes difficult to break down individual components.	• Need exclusivity. • Difficult to replicate and arbitrage (making option pricing models dicey)

Valuing Brand Name

	Coca Cola	With Cott Margins
Current Revenues =	$21,962.00	$21,962.00
Length of high-growth period	10	10
Reinvestment Rate =	50%	50%
Operating Margin (after-tax)	15.57%	5.28%
Sales/Capital (Turnover ratio)	1.34	1.34
Return on capital (after-tax)	20.84%	7.06%
Growth rate during period (g) =	10.42%	3.53%
Cost of Capital during period =	7.65%	7.65%
Stable Growth Period		
Growth rate in steady state =	4.00%	4.00%
Return on capital =	7.65%	7.65%
Reinvestment Rate =	52.28%	52.28%
Cost of Capital =	7.65%	7.65%
Value of Firm =	**$79,611.25**	**$15,371.24**

7. Be circumspect about defining debt for cost of capital purposes…

- **General Rule**: Debt generally has the following characteristics:
  - Commitment to make fixed payments in the future
  - The fixed payments are tax deductible
  - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.
- Defined as such, debt should include
  - All interest bearing liabilities, short term as well as long term
  - All leases, operating as well as capital
- Debt should not include
  - Accounts payable or supplier credit

Book Value or Market Value

- For some firms that are in financial trouble, the book value of debt can be substantially higher than the market value of debt. Analysts worry that subtracting out the market value of debt in this case can yield too high a value for equity.
- A discounted cashflow valuation is designed to value a going concern. In a going concern, it is the market value of debt that should count, even if it is much lower than book value.
- In a liquidation valuation, you can subtract out the book value of debt from the liquidation value of the assets.

Converting book debt into market debt,,,,,

But you should consider other potential liabilities when getting to equity value

- If you have under funded pension fund or health care plans, you should consider the under funding at this stage in getting to the value of equity.
  - If you do so, you should not double count by also including a cash flow line item reflecting cash you would need to set aside to meet the unfunded obligation.
  - You should not be counting these items as debt in your cost of capital calculations….
- If you have contingent liabilities - for example, a potential liability from a lawsuit that has not been decided - you should consider the expected value of these contingent liabilities
  - Value of contingent liability = Probability that the liability will occur * Expected value of liability

8. The Value of Control

- The value of the control premium that will be paid to acquire a block of equity will depend upon two factors -
  - **Probability that control of firm will change**: This refers to the probability that incumbent management will be replaced. this can be either through acquisition or through existing stockholders exercising their muscle.
  - **Value of Gaining Control of the Company:** The value of gaining control of a company arises from two sources - the increase in value that can be wrought by changes in the way the company is managed and run, and the side benefits and perquisites of being in control

Value of Gaining Control = Present Value (Value of Company with change in control - Value of company without change in control) + Side Benefits of Control

Hyundai Heavy: Status Quo ($)

Current Cashflow to Firm
EBIT(1-t) : 1,269 Billion Won
- Nt CpX 519
- Chg WC 135
= FCFF 615
Reinvestment Rate = 654/1269=51.5%
Return on capital = 1269/3390 =37.45%

Reinvestment Rate
50%

Return on Capital
30%

Expected Growth in EBIT (1-t)
.50*.30=.15
15%

Stable Growth
g = 5%; Beta = 1.20;
Country Premium= 0.8%
Cost of capital = 9.42%
ROC= 9.42%
Reinvestment Rate=g/ROC
=5/9.42 = 53.1%

Terminal Value5= 1258(.0942-.05) = 28,471

Wn Cashflows

Year	1	2	3	4	5	Term Yr
EBIT (1-t)	1,460	1,679	1,931	2,220	2,553	2,681
- Reinvestment	730	839	965	1,110	1,277	1,423
FCFF	730	839	965	1,110	1,277	=1,258

Op. Assets	20,211
+ Cash:	3,612
+ Non-0p	3,937
- Debt	186
=Equity	27,574
-Options	0
Value/Share	362.82
(362,820 Won/Sh)	

Discount at $ Cost of Capital (WACC) = 11.3% (.993) + 4.75% (0.007) = 11.26%

On June 1, 2008 Hyundai Heavy traded at 350,000 Won/share.

Cost of Equity
11.30%

Cost of Debt
(5%+0.8%+0.75%)(1-.275)
= 4.75%

Weights
E = 99.3% D = 0.7%

Riskfree Rate:
Won Riskfree Rate= 5%

+

Beta
1.50

X

Mature market premium
4 %

+

Lambda
0.25

X

Country Equity Risk Premium
1.20%

Unlevered Beta for Sectors: 0.75

Firm's D/E Ratio: 26.84%

Country Default Spread
0.8%

X

Rel Equity Mkt Vol
1.20

Hyundai Heavy: Restructured($)

Current Cashflow to Firm
EBIT(1-t) : 1,269 Billion Won
- Nt CpX 519
- Chg WC 135
= FCFF 615
Reinvestment Rate = 654/1269=51.5%
Return on capital = 1269/3390 =37.45%

Reinvestment Rate
50%

Return on Capital
30%

Expected Growth in EBIT (1-t)
.50*.30=.15
15%

Stable Growth
g = 5%; Beta = 1.20;
Country Premium= 0.8%
Cost of capital = 9.42%
ROC= 9.42%
Reinvestment Rate=g/ROC
=5/9.42 = 53.1%

Terminal Value5= 1932(.0942-.05) = 43,732

Op. Assets 23,112
+ Cash: 3,612
+ Non-0p 3,937
- Debt 186
=Equity 30,481
-Options 0
Value/Share 401.06
(401,060 Won/Sh)

Wn Cashflows

Year	1	2	3	4	5	6	7	8	9	10	Term Yr
EBIT (1-t)	1,460	1,679	1,931	2,220	2,553	2,885	3,203	3,491	3,735	3,922	4,118
- Reinvestment	730	839	965	1,110	1,277	1,461	1,641	1,810	1,960	2,082	2,186
FCFF	730	839	965	1,110	1,277	1,425	1,562	1,681	1,775	1,840	=1,932

Discount at $ Cost of Capital (WACC) = 11.3% (.9) + 4.75% (0.1) = 11.16%

On June 1, 2008
Hyundai Heavy traded at
350,000 Won/share.

Cost of Equity
11.74%

Cost of Debt
(5%+0.8%+1.8%)(1-.275)
= 5.51%

Weights
E = 90% D = 10%

Riskfree Rate:
Won Riskfree Rate= 5%

+

Beta
1.61

X

Mature market premium
4 %

+

Lambda
0.25

X

Country Equity Risk Premium
1.20%

Unlevered Beta for Sectors: 0.75

Firm's D/E Ratio: 26.84%

Country Default Spread
0.8%

X

Rel Equity Mkt Vol
1.20

The Value of Control in a publicly traded firm..

- If the value of a firm run optimally is significantly higher than the value of the firm with the status quo (or incumbent management), you can write the value that you should be willing to pay as:

  Value of control = Value of firm optimally run - Value of firm with status quo

  Value of control at Hyundai Heavy= 401 Won per share – 362 Won per share = 39 Won per share

- Implications:
  - In an acquisition, this is the most that you would be willing to pay as a premium (assuming no other synergy)
  - As a stockholder, you will be willing to pay a value between 362 and 401 Wn, depending upon your views on whether control will change.
  - If there are voting and non-voting shares, the difference in prices between the two should reflect the value of control.

Minority and Majority interests in a private firm

- When you get a controlling interest in a private firm (generally >51%, but could be less…), you would be willing to pay the appropriate proportion of the optimal value of the firm.
- When you buy a minority interest in a firm, you will be willing to pay the appropriate fraction of the status quo value of the firm.
- For badly managed firms, there can be a significant difference in value between 51% of a firm and 49% of the same firm. This is the minority discount.
- If you own a private firm and you are trying to get a private equity or venture capital investor to invest in your firm, it may be in your best interests to offer them a share of control in the firm even though they may have well below 51%.

9. Distress and the Going Concern Assumption

- Traditional valuation techniques are built on the assumption of a going concern, i.e., a firm that has continuing operations and there is no significant threat to these operations.
  - In discounted cashflow valuation, this going concern assumption finds its place most prominently in the terminal value calculation, which usually is based upon an infinite life and ever-growing cashflows.
  - In relative valuation, this going concern assumption often shows up implicitly because a firm is valued based upon how other firms - most of which are healthy - are priced by the market today.
- When there is a significant likelihood that a firm will not survive the immediate future (next few years), traditional valuation models may yield an over-optimistic estimate of value.

Current Revenue
$ 3,804

Current Margin:
-49.82%

EBIT
-1895m

NOL:
2,076m

Cap ex growth slows and net cap ex decreases

Revenue Growth:
13.33%

EBITDA/Sales
-> 30%

Stable Growth

Stable Revenue Growth: 5%

Stable EBITDA/ Sales 30%

Stable ROC=7.36%
Reinvest 67.93%

Terminal Value= 677(.0736-.05)
=$ 28,683

	1	2	3	4	5	6	7	8	9	10	Term. Year
Revenues	$3,804	$5,326	$6,923	$8,308	$9,139	$10,053	$11,058	$11,942	$12,659	$13,292	$13,902
EBITDA	($95)	$ 0	$346	$831	$1,371	$1,809	$2,322	$2,508	$3,038	$3,589	$ 4,187
EBIT	($1,675)	($1,738)	($1,565)	($1,272)	$320	$1,074	$1,550	$1,697	$2,186	$2,694	$ 3,248
EBIT (1-t)	($1,675)	($1,738)	($1,565)	($1,272)	$320	$1,074	$1,550	$1,697	$2,186	$2,276	$ 2,111
+ Depreciation	$1,580	$1,738	$1,911	$2,102	$1,051	$736	$773	$811	$852	$894	$ 939
- Cap Ex	$3,431	$1,716	$1,201	$1,261	$1,324	$1,390	$1,460	$1,533	$1,609	$1,690	$ 2,353
- Chg WC	$ 0	$46	$48	$42	$25	$27	$30	$27	$21	$19	$ 20
FCFF	($3,526)	($1,761)	($903)	($472)	$22	$392	$832	$949	$1,407	$1,461	$ 677

Forever

Value of Op Assets	$	5,530
+ Cash & Non-op	$	2,260
= Value of Firm	$	7,790
- Value of Debt	$	4,923
= Value of Equity	$	2867
- Equity Options	$	14
Value per share	$	3.22

	1	2	3	4	5	6	7	8	9	10
Beta	3.00	3.00	3.00	3.00	3.00	2.60	2.20	1.80	1.40	1.00
Cost of Equity	16.80%	16.80%	16.80%	16.80%	16.80%	15.20%	13.60%	12.00%	10.40%	8.80%
Cost of Debt	12.80%	12.80%	12.80%	12.80%	12.80%	11.84%	10.88%	9.92%	8.96%	6.76%
Debt Ratio	74.91%	74.91%	74.91%	74.91%	74.91%	67.93%	60.95%	53.96%	46.98%	40.00%
Cost of Capital	13.80%	13.80%	13.80%	13.80%	13.80%	12.92%	11.94%	10.88%	9.72%	7.98%

Cost of Equity
16.80%

Cost of Debt
4.8%+8.0%=12.8%
Tax rate = 0% -> 35%

Weights
Debt= 74.91% -> 40%

Riskfree Rate:
T. Bond rate = 4.8%

+

Beta
3.00> 1.10

X

Risk Premium
4%

Internet/ Retail

Operating Leverage

Current D/E: 441%

Base Equity Premium

Country Risk Premium

Global Crossing
November 2001
Stock price = $1.86

Valuing Global Crossing with Distress

- Probability of distress
  - Price of 8 year, 12% bond issued by Global Crossing = $ 653

$$653 = \sum_{t=1}^{t=8} \frac{120(1-\pi_{Distress})^t}{(1.05)^t} + \frac{1000(1-\pi_{Distress})^8}{(1.05)^8}$$

  - Probability of distress = 13.53% a year
  - Cumulative probability of survival over 10 years = $(1- .1353)^{10}$ = 23.37%
- Distress sale value of equity
  - Book value of capital = $14,531 million
  - Distress sale value = 15% of book value = .15*14531 = $2,180 million
  - Book value of debt = $7,647 million
  - Distress sale value of equity = $ 0
- Distress adjusted value of equity
  - Value of Global Crossing = $3.22 (.2337) + $0.00 (.7663) = $0.75

10. Equity to Employees: Effect on Value

- In recent years, firms have turned to giving employees (and especially top managers) equity option packages as part of compensation. These options are usually
  - Long term
  - At-the-money when issued
  - On volatile stocks
- Are they worth money? And if yes, who is paying for them?
- Two key issues with employee options:
  - How do options granted in the past affect equity value per share today?
  - How do expected future option grants affect equity value today?

Equity Options and Value

- Options outstanding
  - Step 1: List all options outstanding, with maturity, exercise price and vesting status.
  - Step 2: Value the options, taking into account dilution, vesting and early exercise considerations
  - Step 3: Subtract from the value of equity and divide by the actual number of shares outstanding (not diluted or partially diluted).
- Expected future option and restricted stock issues
  - Step 1: Forecast value of options that will be granted each year as percent of revenues that year. (As firm gets larger, this should decrease)
  - Step 2: Treat as operating expense and reduce operating income and cash flows
  - Step 3: Take present value of cashflows to value operations or equity.

11. Analyzing the Effect of Illiquidity on Value

- Investments which are less liquid should trade for less than otherwise similar investments which are more liquid.
- The size of the illiquidity discount should depend upon
  - *Type of Assets owned by the Firm*: The more liquid the assets owned by the firm, the lower should be the liquidity discount for the firm
  - *Size of the Firm*: The larger the firm, the smaller should be size of the liquidity discount.
  - *Health of the Firm*: Stock in healthier firms should sell for a smaller discount than stock in troubled firms.
  - *Cash Flow Generating Capacity*: Securities in firms which are generating large amounts of cash from operations should sell for a smaller discounts than securities in firms which do not generate large cash flows.
  - *Size of the Block*: The liquidity discount should increase with the size of the portion of the firm being sold.

Illiquidity Discount: Restricted Stock Studies

- Restricted securities are securities issued by a company, but not registered with the SEC, that can be sold through private placements to investors, but cannot be resold in the open market for a two-year holding period, and limited amounts can be sold after that. Studies of restricted stock over time have concluded that the discount is between 25 and 35%. Many practitioners use this as the illiquidity discount for all private firms.
- A more nuanced used of restricted stock studies is to relate the discount to fundamental characteristics of the company - level of revenues, health of the company etc.. And to adjust the discount for any firm to reflect its characteristics:
  - The discount will be smaller for larger firms
  - The discount will be smaller for healthier firms

Illiquidity Discounts from Bid-Ask Spreads

- Using data from the end of 2000, for instance, we regressed the bid-ask spread against annual revenues, a dummy variable for positive earnings (DERN: 0 if negative and 1 if positive), cash as a percent of firm value and trading volume.

Spread = 0.145 – 0.0022 ln (Annual Revenues) -0.015 (DERN) – 0.016 (Cash/ Firm Value) – 0.11 ($ Monthly trading volume/ Firm Value)

- We could substitute in the revenues of Kristin Kandy ($5 million), the fact that it has positive earnings and the cash as a percent of revenues held by the firm (8%):

Spread = 0.145 – 0.0022 ln (Annual Revenues) -0.015 (DERN) – 0.016 (Cash/ Firm Value) – 0.11 ($ Monthly trading volume/ Firm Value)

= 0.145 – 0.0022 ln (5) -0.015 (1) – 0.016 (.08) – 0.11 (0) = .12.52%

- Based on this approach, we would estimate an illiquidity discount of 12.52% for Kristin Kandy.

V. Value, Price and Information: Closing the Deal

Current Revenue
$ 1,117

Current Margin:
-36.71%

EBIT
-410m

NOL:
500 m

Reinvestment:
Cap ex includes acquisitions
Working capital is 3% of revenues

Sales Turnover Ratio: 3.00

Competitive Advantages

Revenue Growth:
42%

Expected Margin:
-> 10.00%

Stable Growth

Stable Revenue Growth: 6%

Stable Operating Margin:
10.00%

Stable ROC=20%
Reinvest 30% of EBIT(1-t)

Terminal Value= 1881/(.0961-.06)
=52,148

	1	2	3	4	5	6	7	8	9	10	Term. Year
Revenues	$2,793	5,585	9,774	14,661	19,059	23,862	28,729	33,211	36,798	39,006	$41,346
EBIT	-$373	-$94	$407	$1,038	$1,628	$2,212	$2,768	$3,261	$3,646	$3,883	10.00%
EBIT (1-t)	-$373	-$94	$407	$871	$1,058	$1,438	$1,799	$2,119	$2,370	$2,524	35.00%
- Reinvestment	$559	$931	$1,396	$1,629	$1,466	$1,601	$1,623	$1,494	$1,196	$736	$2,688
FCFF	-$931	-$1,024	-$989	-$758	-$408	-$163	$177	$625	$1,174	$1,788	$ 807
											$1,881

Forever

	1	2	3	4	5	6	7	8	9	10
Cost of Equity	12.90%	12.90%	12.90%	12.90%	12.90%	12.42%	12.30%	12.10%	11.70%	10.50%
Cost of Debt	8.00%	8.00%	8.00%	8.00%	8.00%	7.80%	7.75%	7.67%	7.50%	7.00%
AT cost of debt	8.00%	8.00%	8.00%	6.71%	5.20%	5.07%	5.04%	4.98%	4.88%	4.55%
Cost of Capital	12.84%	12.84%	12.84%	12.83%	12.81%	12.13%	11.96%	11.69%	11.15%	9.61%

Value of Op Assets	$ 14,910
+ Cash	$ 26
= Value of Firm	$14,936
- Value of Debt	$ 349
= Value of Equity	$14,587
- Equity Options	$ 2,892
Value per share	$ 34.32

Cost of Equity
12.90%

Cost of Debt
6.5%+1.5%=8.0%
Tax rate = 0% -> 35%

Weights
Debt= 1.2% -> 15%

Riskfree Rate :
T. Bond rate = 6.5%

\+

Beta
1.60 -> 1.00

x

Risk Premium
4%

Internet/ Retail

Operating Leverage

Current D/E: 1.21%

Base Equity Premium

Country Risk Premium

Amazon.com
January 2000
Stock Price = $ 84

Amazon.com: Break Even at $84?

	6%	8%	10%	12%	14%
30%	$ (1.94)	$ 2.95	$ 7.84	$ 12.71	$ 17.57
35%	$ 1.41	$ 8.37	$ 15.33	$ 22.27	$ 29.21
40%	$ 6.10	$ 15.93	$ 25.74	$ 35.54	$ 45.34
45%	$ 12.59	$ 26.34	$ 40.05	$ 53.77	$ 67.48
50%	$ 21.47	$ 40.50	$ 59.52	$ 78.53	$ 97.54
55%	$ 33.47	$ 59.60	$ 85.72	$ 111.84	$ 137.95
60%	$ 49.53	$ 85.10	$ 120.66	$ 156.22	$ 191.77

Current Revenue
$ 2,465

Current Margin:
-34.60%

EBIT
-853m

NOL:
1,289 m

Reinvestment:
Cap ex includes acquisitions
Working capital is 3% of revenues

Sales Turnover Ratio: 3.02

Competitive Advantages

Revenue Growth:
25.41%

Expected Margin:
-> 9.32%

Stable Growth

Stable Revenue Growth: 5%

Stable Operating Margin:
9.32%

Stable ROC=16.94%
Reinvest 29.5% of EBIT(1-t)

Terminal Value= 1064/(.0876-.05)
=$ 28,310

	1	2	3	4	5	6	7	8	9	10	Term. Year
Revenues	$4,314	$6,471	$9,059	$11,777	$14,132	$16,534	$18,849	$20,922	$22,596	$23,726	$24,912	$24,912
EBIT	-$703	-$364	$54	$499	$898	$1,255	$1,566	$1,827	$2,028	$2,164	$2,322	$2,322
EBIT(1-t)	-$703	-$364	$54	$499	$898	$1,133	$1,018	$1,187	$1,318	$1,406	$1,509	$1,509
- Reinvestment	$612	$714	$857	$900	$780	$796	$766	$687	$554	$374	$445	$ 445
FCFF	-$1,315	-$1,078	-$803	-$401	$118	$337	$252	$501	$764	$1,032	$1,064	$1,064

Forever

Value of Op Assets	$ 7,967
+ Cash & Non-op	$ 1,263
= Value of Firm	$ 9,230
- Value of Debt	$ 1,890
= Value of Equity	$ 7,340
- Equity Options	$ 748
Value per share	$ 18.74

	1	2	3	4	5	6	7	8	9	10
Debt Ratio	27.27%	27.27%	27.27%	27.27%	27.27%	24.81%	24.20%	23.18%	21.13%	15.00%
Beta	2.18	2.18	2.18	2.18	2.18	1.96	1.75	1.53	1.32	1.10
Cost of Equity	13.81%	13.81%	13.81%	13.81%	13.81%	12.95%	12.09%	11.22%	10.36%	9.50%
AT cost of debt	10.00%	10.00%	10.00%	10.00%	9.06%	6.11%	6.01%	5.85%	5.53%	4.55%
Cost of Capital	12.77%	12.77%	12.77%	12.77%	12.52%	11.25%	10.62%	9.98%	9.34%	8.76%

Cost of Equity
13.81%

Cost of Debt
5.1%+4.75%= 9.85%
Tax rate = 0% -> 35%

Weights
Debt= 27.38% -> 15%

Riskfree Rate :
T. Bond rate = 5.1%

+

Beta
2.18-> 1.10

X

Risk Premium
4%

Internet/ Retail

Operating Leverage

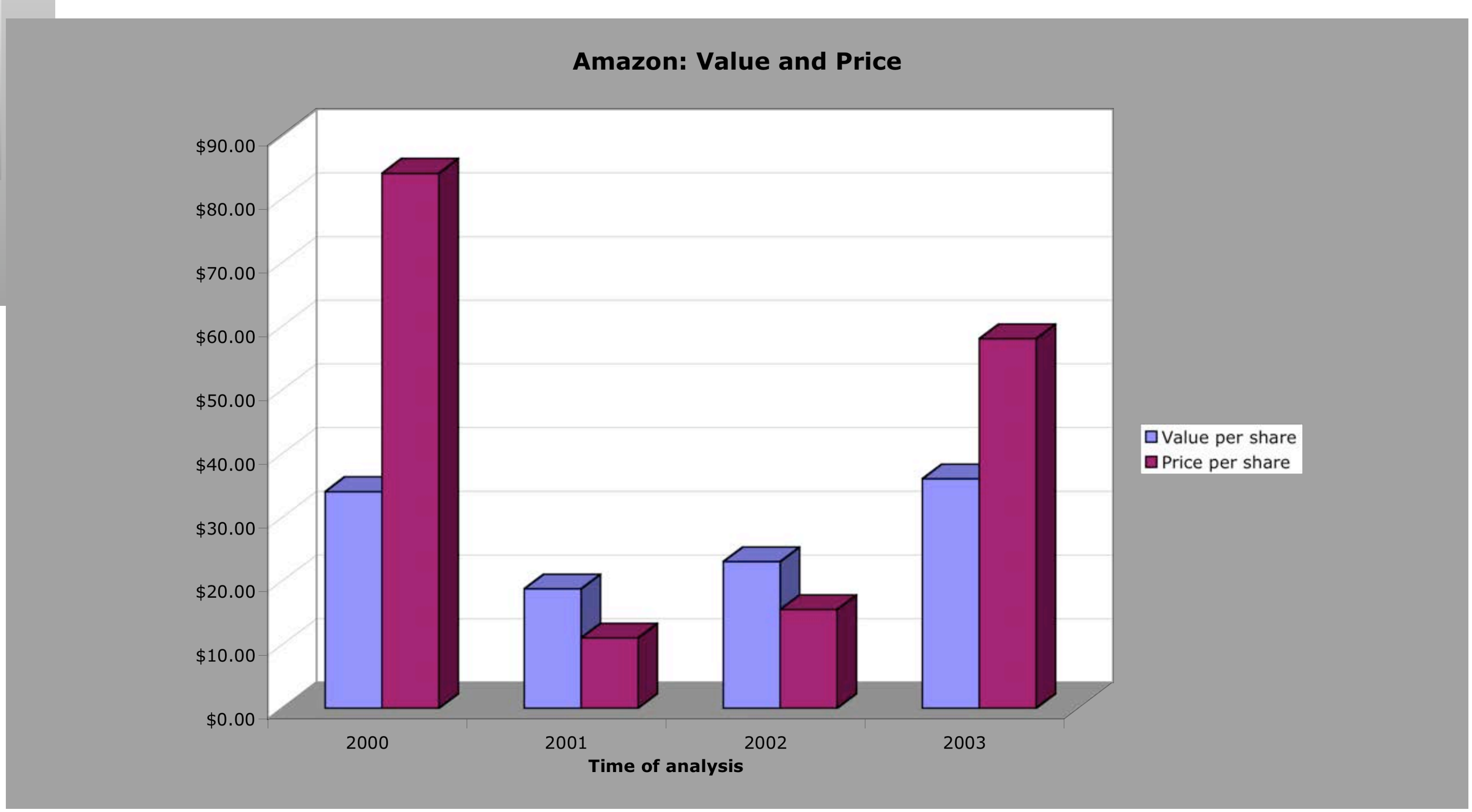
Current D/E: 37.5%

Base Equity Premium

Country Risk Premium

Amazon.com
January 2001
Stock price = $14

Amazon over time…



Relative Valuation

Aswath Damodaran

The Essence of relative valuation?

- In relative valuation, the value of an asset is compared to the values assessed by the market for similar or comparable assets.
- To do relative valuation then,
  - we need to identify comparable assets and obtain market values for these assets
  - convert these market values into standardized values, since the absolute prices cannot be compared This process of standardizing creates price multiples.
  - compare the standardized value or multiple for the asset being analyzed to the standardized values for comparable asset, controlling for any differences between the firms that might affect the multiple, to judge whether the asset is under or over valued

Relative valuation is pervasive…

- Most asset valuations are relative.
- Most equity valuations on Wall Street are relative valuations.
  - Almost 85% of equity research reports are based upon a multiple and comparables.
  - More than 50% of all acquisition valuations are based upon multiples
  - Rules of thumb based on multiples are not only common but are often the basis for final valuation judgments.
- While there are more discounted cashflow valuations in consulting and corporate finance, they are often relative valuations masquerading as discounted cash flow valuations.
  - The objective in many discounted cashflow valuations is to back into a number that has been obtained by using a multiple.
  - The terminal value in a significant number of discounted cashflow valuations is estimated using a multiple.

The Reasons for the allure…

"If you think I'm crazy, you should see the guy who lives across the hall"

Jerry Seinfeld talking about Kramer in a Seinfeld episode

" A little inaccuracy sometimes saves tons of explanation"

H.H. Munro

" If you are going to screw up, make sure that you have lots of company"

Ex-portfolio manager

The Market Imperative….

- Relative valuation is <u>much more likely to reflect market perceptions</u> and moods than discounted cash flow valuation. This can be an advantage when it is important that the price reflect these perceptions as is the case when
  - the objective is to sell a security at that price today (as in the case of an IPO)
  - investing on "momentum" based strategies
- With relative valuation, there will always be a <u>significant proportion</u> of securities that are <u>under valued and over valued</u>.
- Since portfolio managers are <u>judged</u> based upon how they perform <u>on a relative basis</u> (to the market and other money managers), relative valuation is more tailored to their needs
- Relative valuation generally <u>requires less information</u> than discounted cash flow valuation (especially when multiples are used as screens)

The Four Steps to Deconstructing Multiples

- Define the multiple
  - In use, the same multiple can be defined in different ways by different users. When comparing and using multiples, estimated by someone else, it is critical that we understand how the multiples have been estimated
- Describe the multiple
  - Too many people who use a multiple have no idea what its cross sectional distribution is. If you do not know what the cross sectional distribution of a multiple is, it is difficult to look at a number and pass judgment on whether it is too high or low.
- Analyze the multiple
  - It is critical that we understand the fundamentals that drive each multiple, and the nature of the relationship between the multiple and each variable.
- Apply the multiple
  - Defining the comparable universe and controlling for differences is far more difficult in practice than it is in theory.

Definitional Tests

- Is the multiple consistently defined?
  - **Proposition 1: Both the value (the numerator) and the standardizing variable (the denominator) should be to the same claimholders in the firm. In other words, the value of equity should be divided by equity earnings or equity book value, and firm value should be divided by firm earnings or book value.**
- Is the multiple uniformly estimated?
  - The variables used in defining the multiple should be estimated uniformly across assets in the "comparable firm" list.
  - If earnings-based multiples are used, the accounting rules to measure earnings should be applied consistently across assets. The same rule applies with book-value based multiples.

Example 1: Price Earnings Ratio: Definition

PE = Market Price per Share / Earnings per Share

- There are a number of variants on the basic PE ratio in use. They are based upon how the price and the earnings are defined.
- Price: is usually the current price
  is sometimes the average price for the year
- EPS: earnings per share in most recent financial year
  earnings per share in trailing 12 months (Trailing PE)
  forecasted earnings per share next year (Forward PE)
  forecasted earnings per share in future year

Example 2: Enterprise Value /EBITDA Multiple

- The enterprise value to EBITDA multiple is obtained by netting cash out against debt to arrive at enterprise value and dividing by EBITDA.

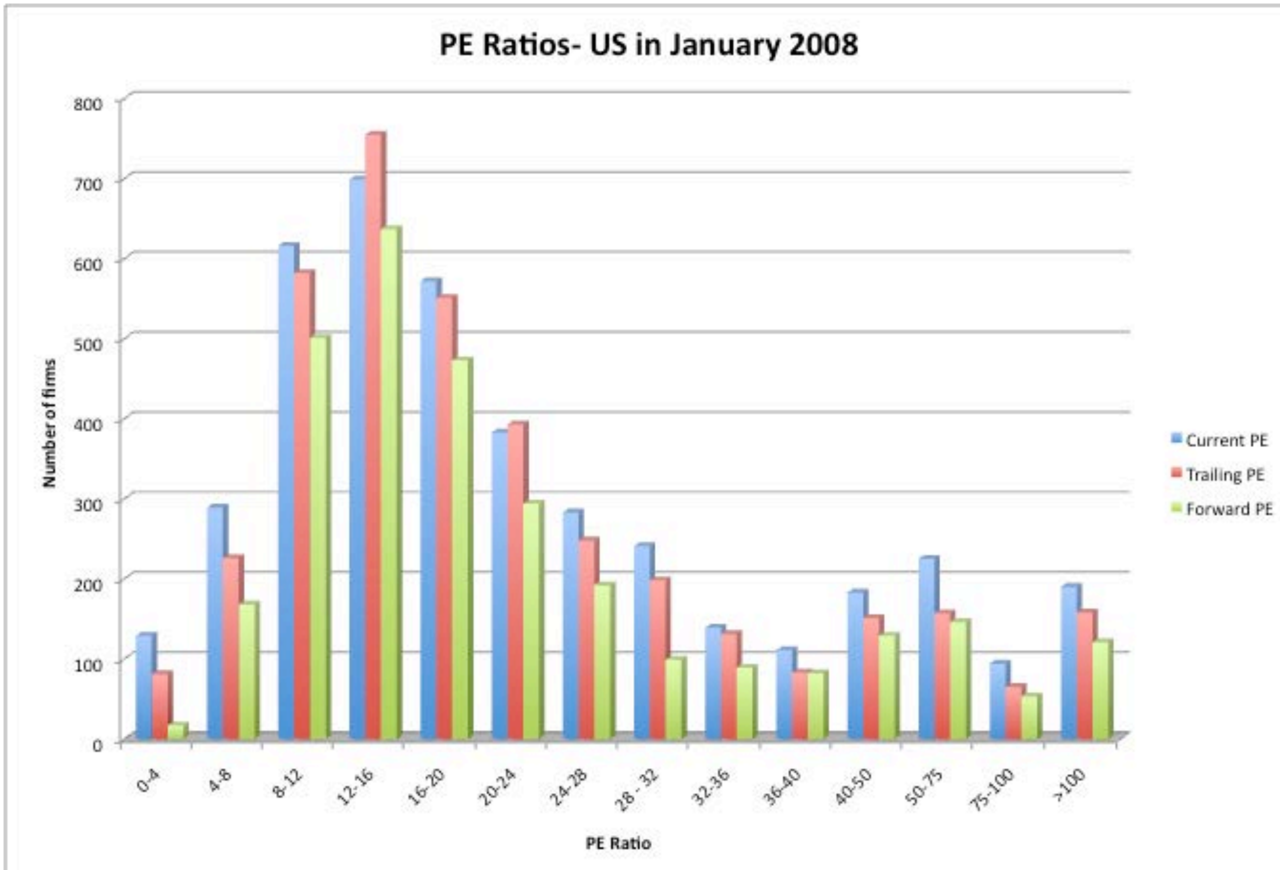
$$\frac{\text{Enterprise Value}}{\text{EBITDA}} = \frac{\text{Market Value of Equity} + \text{Market Value of Debt} - \text{Cash}}{\text{Earnings before Interest, Taxes and Depreciation}}$$

- Why do we net out cash from firm value?
- What happens if a firm has cross holdings which are categorized as:
  - Minority interests?
  - Majority active interests?

Descriptive Tests

- What is the average and standard deviation for this multiple, across the universe (market)?
- What is the median for this multiple?
  - The median for this multiple is often a more reliable comparison point.
- How large are the outliers to the distribution, and how do we deal with the outliers?
  - Throwing out the outliers may seem like an obvious solution, but if the outliers all lie on one side of the distribution (they usually are large positive numbers), this can lead to a biased estimate.
- Are there cases where the multiple cannot be estimated? Will ignoring these cases lead to a biased estimate of the multiple?
- How has this multiple changed over time?

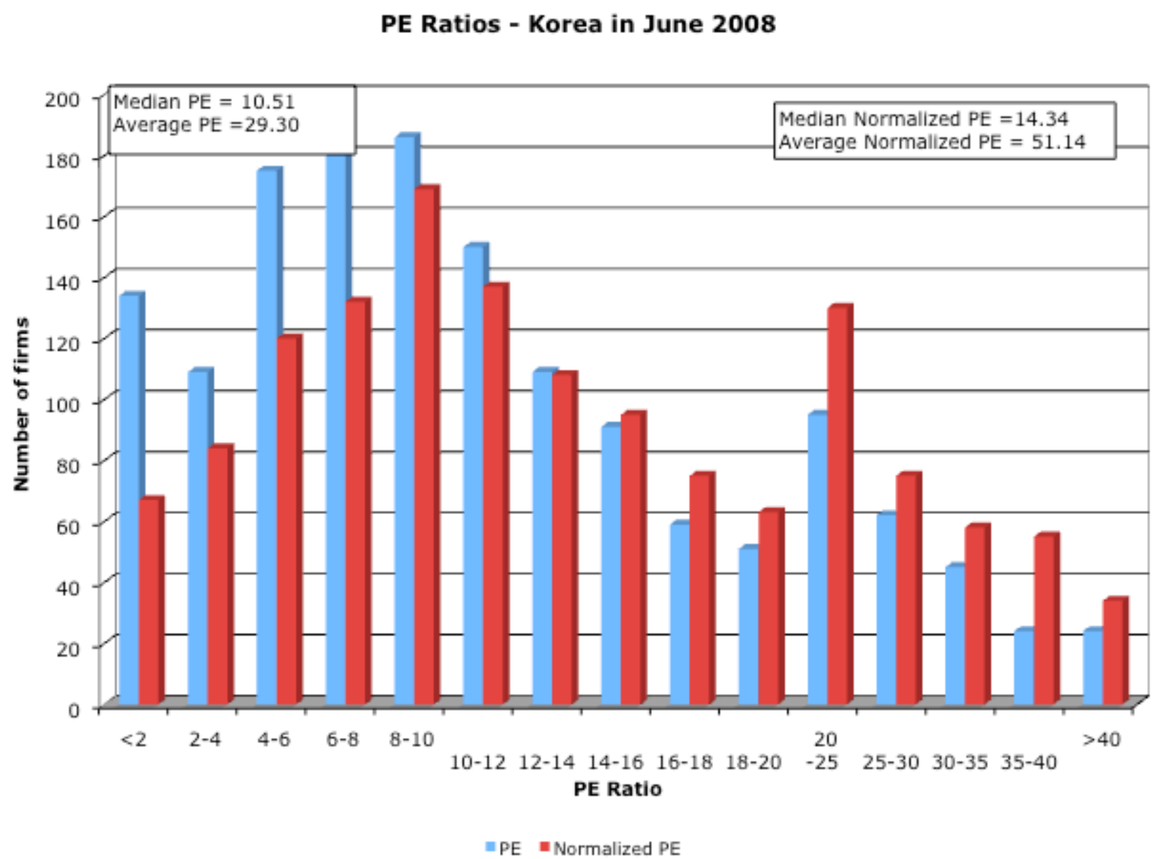
Looking at the distribution…



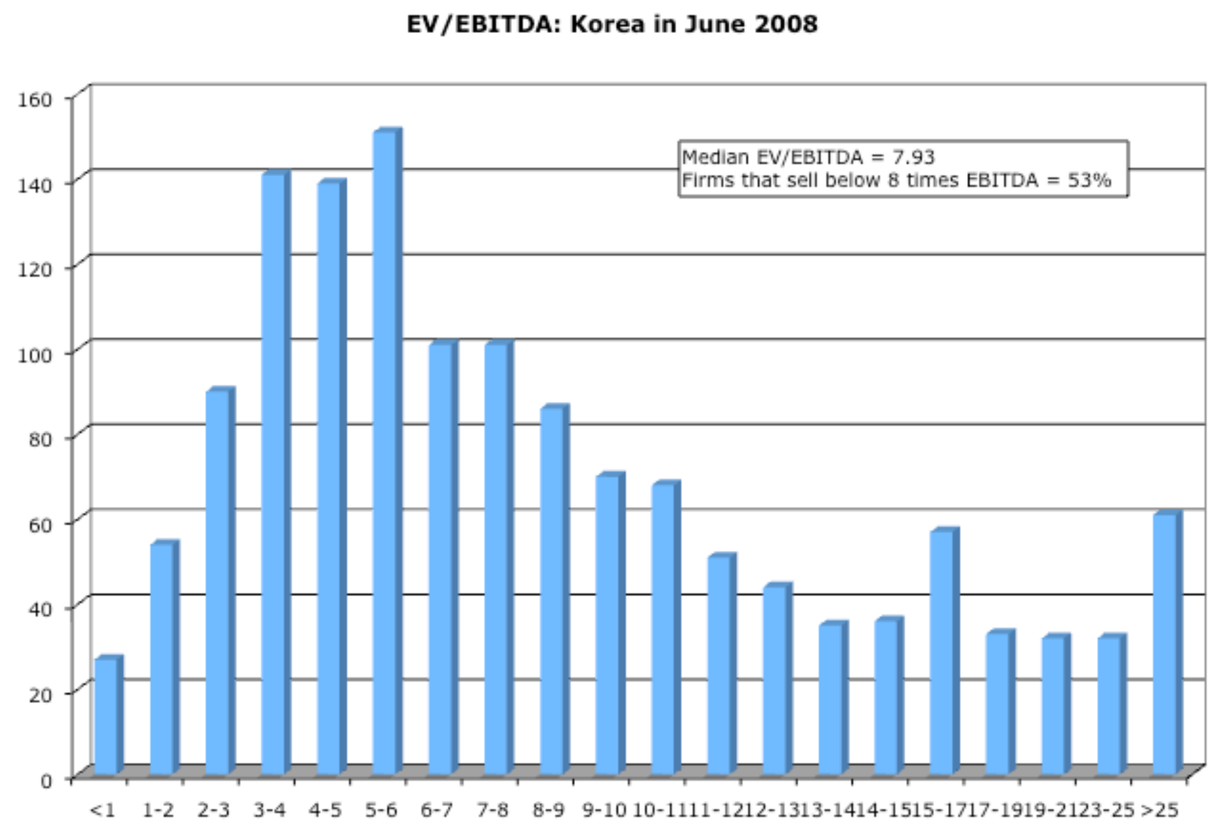
PE: Deciphering the Distribution

	Current PE	Trailing PE	Forward PE
Mean	45.02	32.44	32.21
Standard Error	4.64	1.96	1.47
Median	18.16	17.00	17.28
Standard Deviation	299.11	123.29	80.82
Sample Variance	89468.12	15199.29	6532.53
Kurtosis	1618.20	1241.97	269.80
Skewness	35.41	30.30	14.23
Maximum	15126.20	5713.00	1912.33
Count	4155	3944	3004

PE Ratios in Korea…



And 8 times EBITDA is not cheap



Analytical Tests

- What are the fundamentals that determine and drive these multiples?
  - Proposition 2: Embedded in every multiple are all of the variables that drive every discounted cash flow valuation - growth, risk and cash flow patterns.
  - In fact, using a simple discounted cash flow model and basic algebra should yield the fundamentals that drive a multiple
- How do changes in these fundamentals change the multiple?
  - The relationship between a fundamental (like growth) and a multiple (such as PE) is seldom linear. For example, if firm A has twice the growth rate of firm B, it will generally not trade at twice its PE ratio
  - **Proposition 3: It is impossible to properly compare firms on a multiple, if we do not know the nature of the relationship between fundamentals and the multiple.**

PE Ratio: Understanding the Fundamentals

- To understand the fundamentals, start with a basic <u>equity</u> discounted cash flow model.
- With the dividend discount model,

$$P_0 = \frac{DPS_1}{r - g_n}$$

- Dividing both sides by the current earnings per share,

$$\frac{P_0}{EPS_0} = PE = \frac{\text{Payout Ratio} * (1 + g_n)}{r\text{-}g_n}$$

- If this had been a FCFE Model,

$$P_0 = \frac{FCFE_1}{r - g_n}$$

$$\frac{P_0}{EPS_0} = PE = \frac{(\text{FCFE/Earnings}) * (1 + g_n)}{r\text{-}g_n}$$

Using the Fundamental Model to Estimate PE For a High Growth Firm

- The price-earnings ratio for a high growth firm can also be related to fundamentals. In the special case of the two-stage dividend discount model, this relationship can be made explicit fairly simply:

$$P_0 = \frac{EPS_0 * \text{Payout Ratio} * (1+g) * \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)}{r - g} + \frac{EPS_0 * \text{Payout Ratio}_n * (1+g)^n * (1+g_n)}{(r - g_n)(1+r)^n}$$

  - For a firm that does not pay what it can afford to in dividends, substitute FCFE/ Earnings for the payout ratio.

- Dividing both sides by the earnings per share:

$$\frac{P_0}{EPS_0} = \frac{\text{Payout Ratio} * (1+g) * \left(1 - \frac{(1+g)^n}{(1+r)^n}\right)}{r - g} + \frac{\text{Payout Ratio}_n * (1+g)^n * (1+g_n)}{(r - g_n)(1+r)^n}$$

A Simple Example

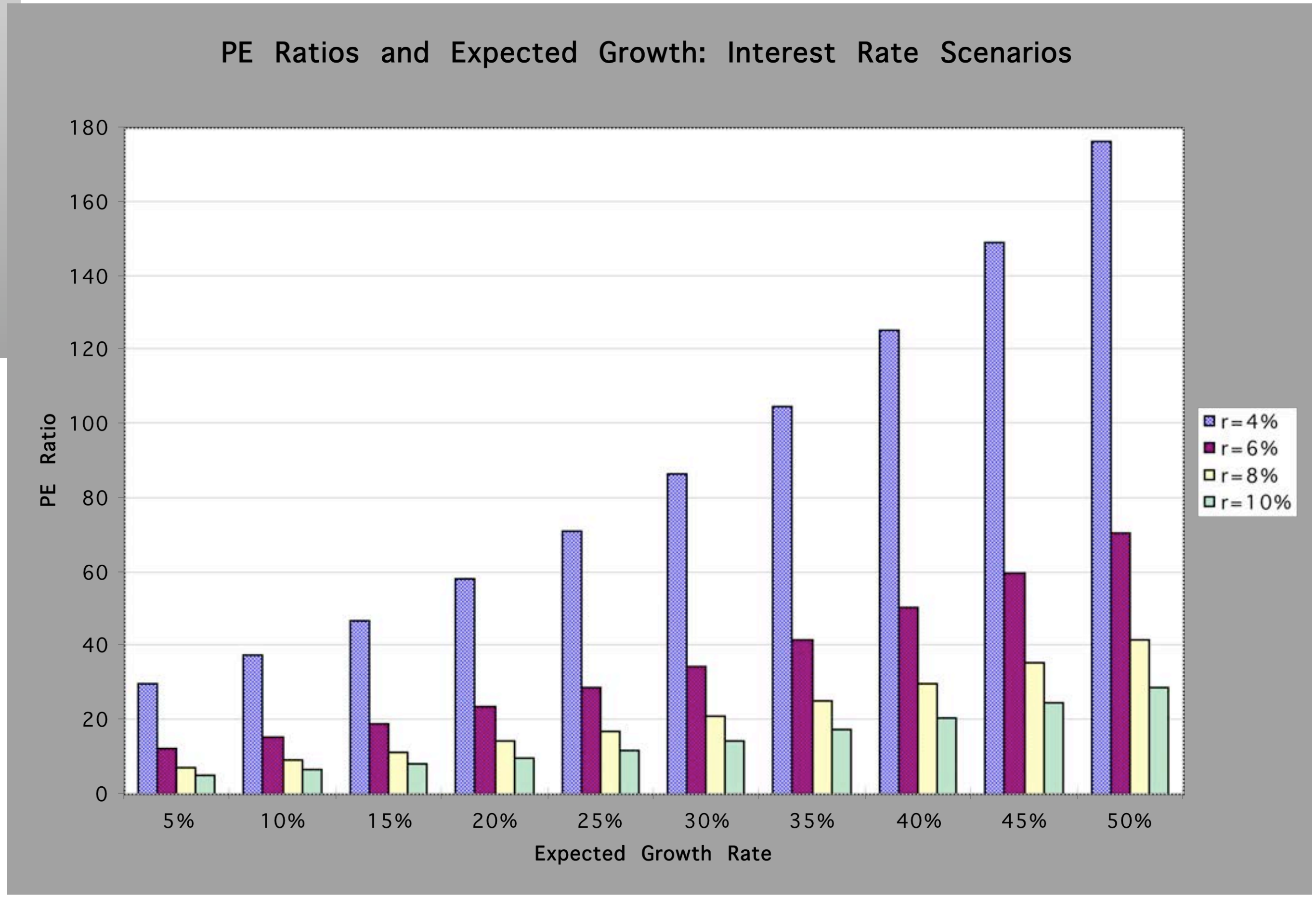
- Assume that you have been asked to estimate the PE ratio for a firm which has the following characteristics:

Variable	High Growth Phase	Stable Growth Phase
Expected Growth Rate	25%	8%
Payout Ratio	20%	50%
Beta	1.00	1.00
Number of years	5 years	Forever after year 5

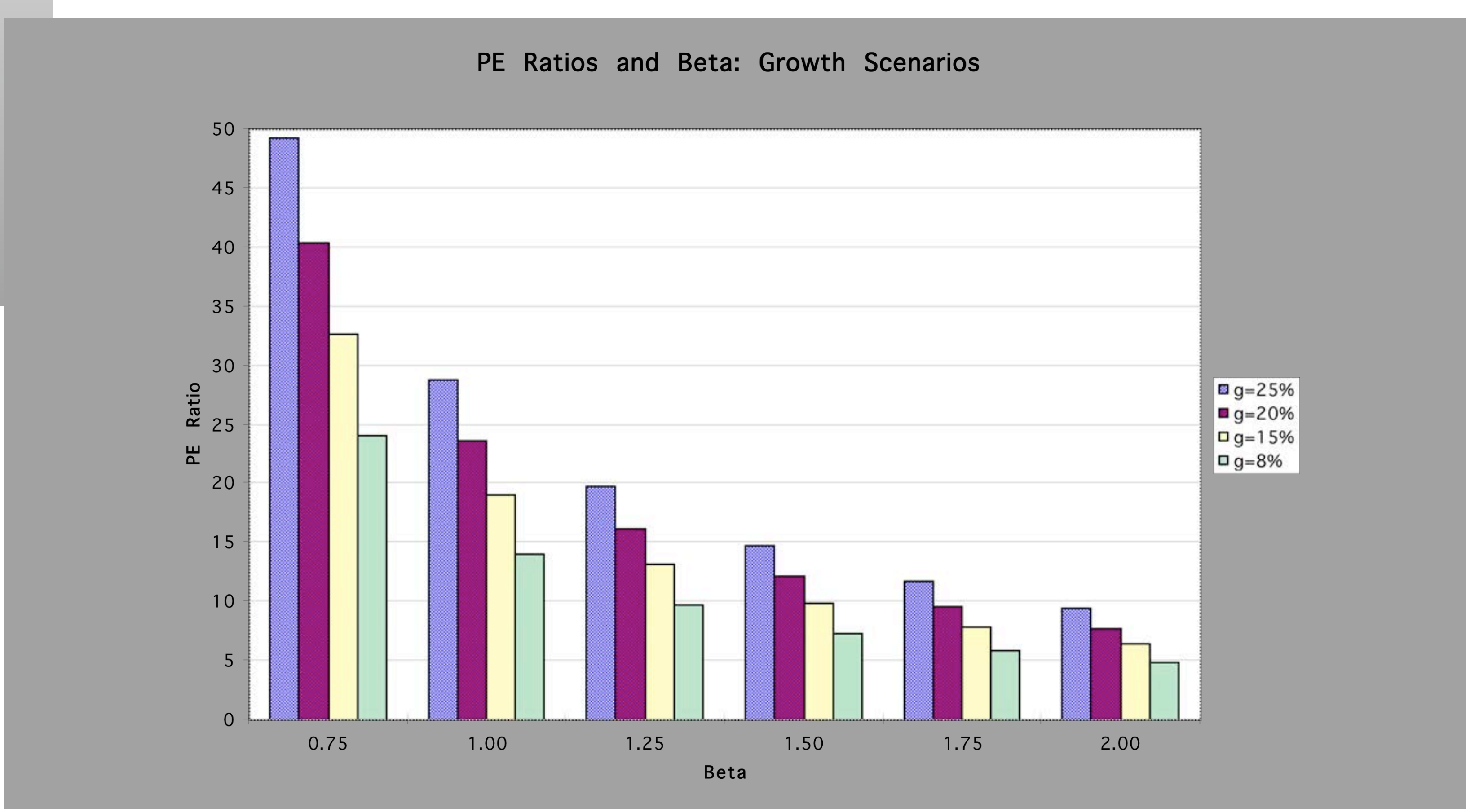
- Riskfree rate = T.Bond Rate = 6%
- Required rate of return = 6% + 1(5.5%)= 11.5%

$$PE = \frac{0.2 \; * \; (1.25) \; * \left(1 - \frac{(1.25)^5}{(1.115)^5}\right)}{(.115 \; - \; .25)} + \frac{0.5 \; * \; (1.25)^5 * (1.08)}{(.115 - .08)\,(1.115)^5} = 28.75$$

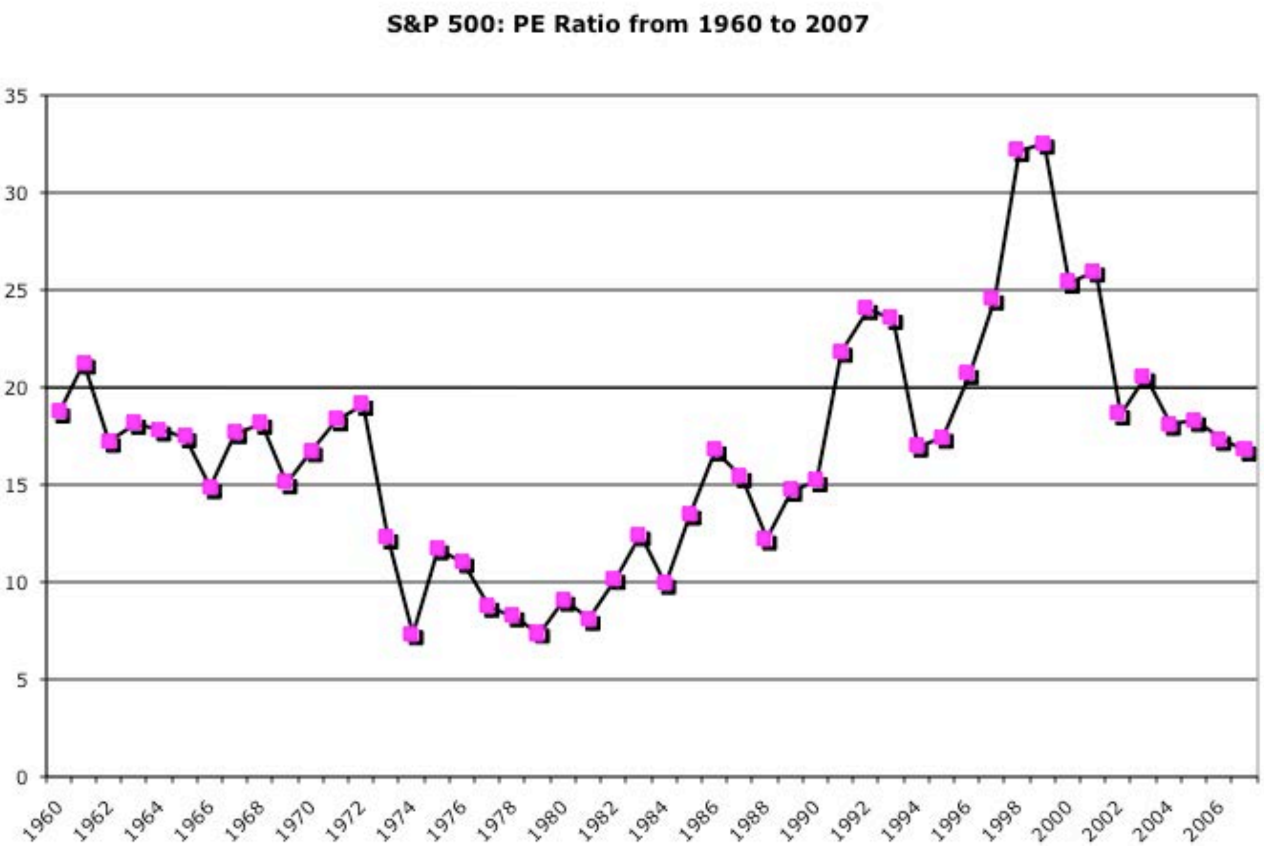
a. PE and Growth: Firm grows at x% for 5 years, 8% thereafter



b. PE and Risk: A Follow up Example



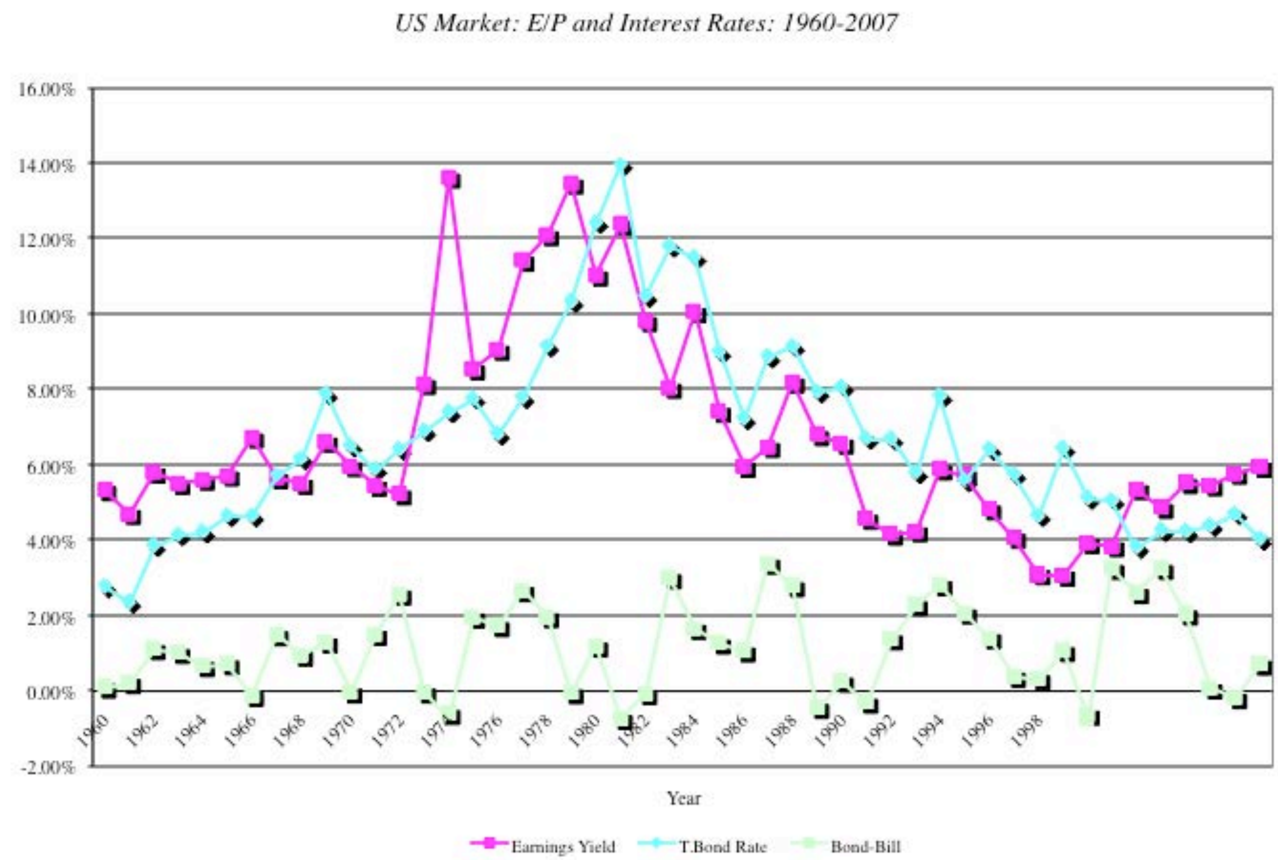
Comparisons of PE across time: PE Ratio for the S&P 500



Is low (high) PE cheap (expensive)?

- A market strategist argues that stocks are over priced because the PE ratio today is too high relative to the average PE ratio across time. Do you agree?
  - ❑ Yes
  - ❑ No
- If you do not agree, what factors might explain the higher PE ratio today?

E/P Ratios , T.Bond Rates and Term Structure



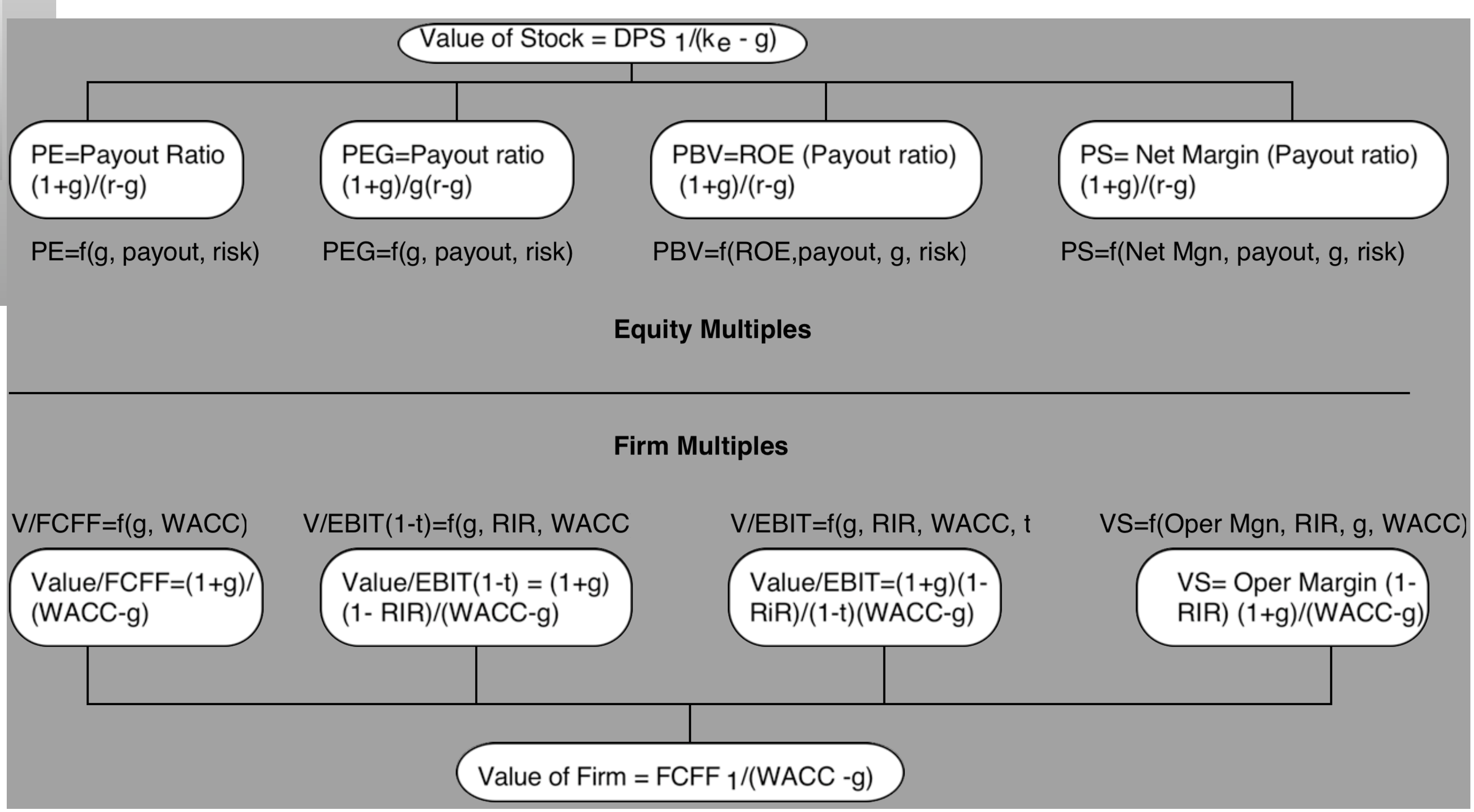
Regression Results

- There is a strong positive relationship between E/P ratios and T.Bond rates, as evidenced by the correlation of 0.70 between the two variables.,
- In addition, there is evidence that the term structure also affects the PE ratio.
- In the following regression, using 1960-2007 data, we regress E/P ratios against the level of T.Bond rates and a term structure variable (T.Bond - T.Bill rate)

$$E/P = 2.19\% + 0.734 \text{ T.Bond Rate} - 0.335 \text{ (T.Bond Rate-T.Bill Rate)}$$
$$\quad (2.70) \qquad (6.80) \qquad (-1.41)$$

R squared = 51.23%

The Determinants of Multiples…



Application Tests

- Given the firm that we are valuing, what is a “comparable” firm?
  - While traditional analysis is built on the premise that firms in the same sector are comparable firms, valuation theory would suggest that a comparable firm is one which is similar to the one being analyzed in terms of fundamentals.
  - **Proposition 4: There is no reason why a firm cannot be compared with another firm in a very different business, if the two firms have the same risk, growth and cash flow characteristics.**
- Given the comparable firms, how do we adjust for differences across firms on the fundamentals?
  - **Proposition 5: It is impossible to find an exactly identical firm to the one you are valuing.**

I. Comparing PE Ratios across a Sector: PE

Company Name	PE	Growth
PT Indosat ADR	7.8	0.06
Telebras ADR	8.9	0.075
Telecom Corporation of New Zealand ADR	11.2	0.11
Telecom Argentina Stet - France Telecom SA ADR B	12.5	0.08
Hellenic Telecommunication Organization SA ADR	12.8	0.12
Telecomunicaciones de Chile ADR	16.6	0.08
Swisscom AG ADR	18.3	0.11
Asia Satellite Telecom Holdings ADR	19.6	0.16
Portugal Telecom SA ADR	20.8	0.13
Telefonos de Mexico ADR L	21.1	0.14
Matav RT ADR	21.5	0.22
Telstra ADR	21.7	0.12
Gilat Communications	22.7	0.31
Deutsche Telekom AG ADR	24.6	0.11
British Telecommunications PLC ADR	25.7	0.07
Tele Danmark AS ADR	27	0.09
Telekomunikasi Indonesia ADR	28.4	0.32
Cable & Wireless PLC ADR	29.8	0.14
APT Satellite Holdings ADR	31	0.33
Telefonica SA ADR	32.5	0.18
Royal KPN NV ADR	35.7	0.13
Telecom Italia SPA ADR	42.2	0.14
Nippon Telegraph & Telephone ADR	44.3	0.2
France Telecom SA ADR	45.2	0.19
Korea Telecom ADR	71.3	0.44

PE, Growth and Risk

Dependent variable is: PE

R squared = 66.2% R squared (adjusted) = 63.1%

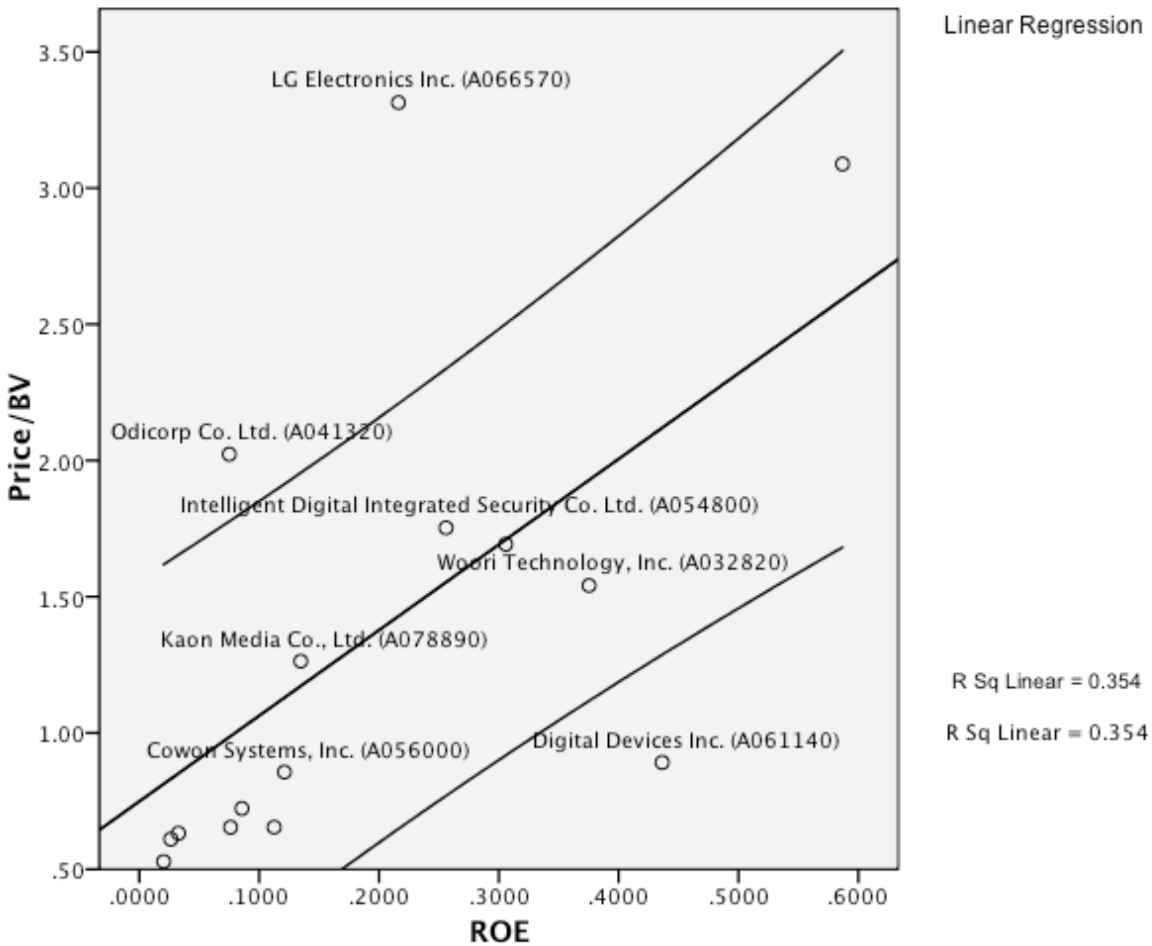
Variable	Coefficient	SE	t-ratio	prob
Constant	13.1151	3.471	3.78	0.0010
Growth rate	121.223	19.27	6.29	≤ 0.0001
Emerging Market	-13.8531	3.606	-3.84	0.0009

Emerging Market is a dummy: 1 if emerging market
0 if not

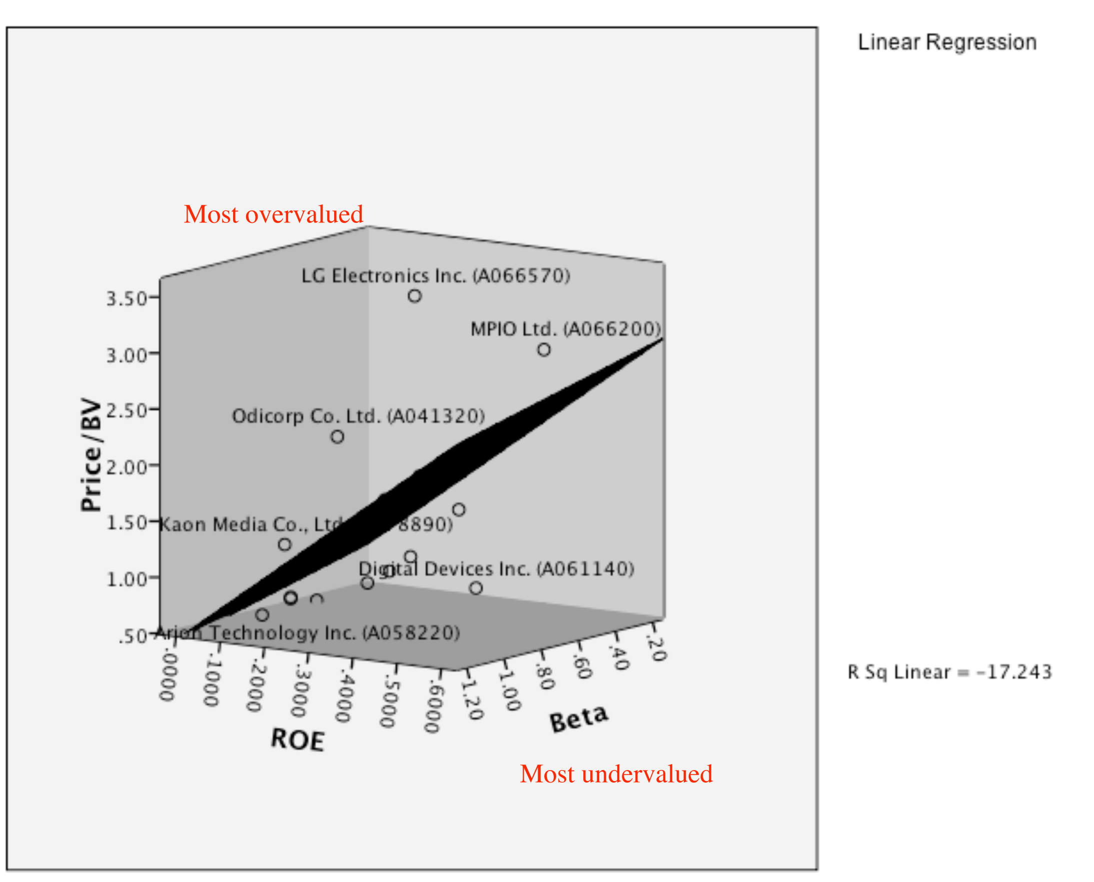
Is Telebras under valued?

- Predicted PE = 13.12 + 121.22 (.075) - 13.85 (1) = 8.35
- At an actual price to earnings ratio of 8.9, Telebras is slightly overvalued.

II. Price to Book vs ROE: Korean Consumer Electronics Stocks in June 2008



A Risk Adjusted Version?



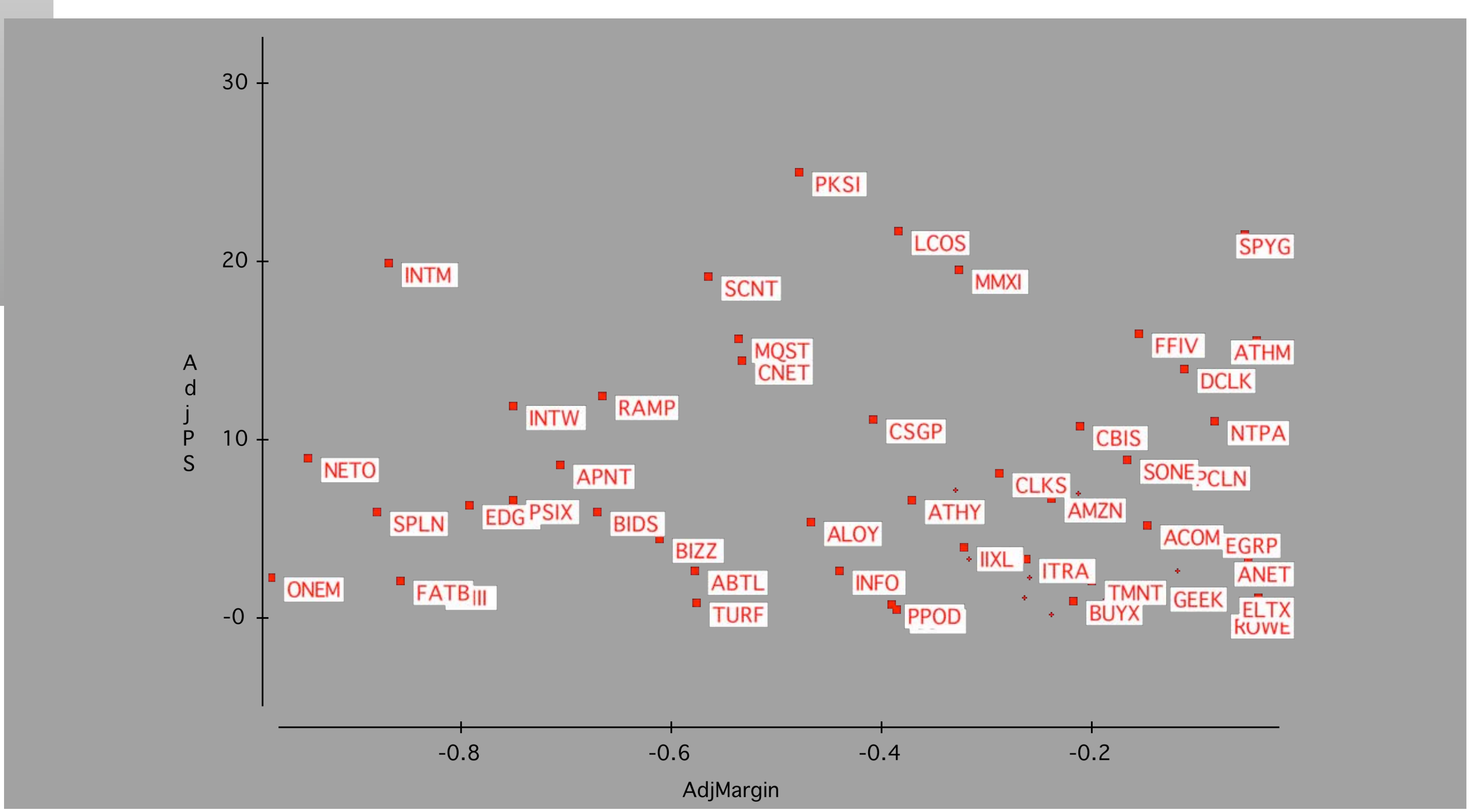
III. Value/EBITDA Multiple: Trucking Companies

Company Name	Value	EBITDA	Value/EBITDA
KLLM Trans. Svcs.	$ 114.32	$ 48.81	2.34
Ryder System	$ 5,158.04	$ 1,838.26	2.81
Rollins Truck Leasing	$ 1,368.35	$ 447.67	3.06
Cannon Express Inc.	$ 83.57	$ 27.05	3.09
Hunt (J.B.)	$ 982.67	$ 310.22	3.17
Yellow Corp.	$ 931.47	$ 292.82	3.18
Roadway Express	$ 554.96	$ 169.38	3.28
Marten Transport Ltd.	$ 116.93	$ 35.62	3.28
Kenan Transport Co.	$ 67.66	$ 19.44	3.48
M.S. Carriers	$ 344.93	$ 97.85	3.53
Old Dominion Freight	$ 170.42	$ 45.13	3.78
Trimac Ltd	$ 661.18	$ 174.28	3.79
Matlack Systems	$ 112.42	$ 28.94	3.88
XTRA Corp.	$ 1,708.57	$ 427.30	4.00
Covenant Transport Inc	$ 259.16	$ 64.35	4.03
Builders Transport	$ 221.09	$ 51.44	4.30
Werner Enterprises	$ 844.39	$ 196.15	4.30
Landstar Sys.	$ 422.79	$ 95.20	4.44
AMERCO	$ 1,632.30	$ 345.78	4.72
USA Truck	$ 141.77	$ 29.93	4.74
Frozen Food Express	$ 164.17	$ 34.10	4.81
Arnold Inds.	$ 472.27	$ 96.88	4.87
Greyhound Lines Inc.	$ 437.71	$ 89.61	4.88
USFreightways	$ 983.86	$ 198.91	4.95
Golden Eagle Group Inc.	$ 12.50	$ 2.33	5.37
Arkansas Best	$ 578.78	$ 107.15	5.40
Airlease Ltd.	$ 73.64	$ 13.48	5.46
Celadon Group	$ 182.30	$ 32.72	5.57
Amer. Freightways	$ 716.15	$ 120.94	5.92
Transfinancial Holdings	$ 56.92	$ 8.79	6.47
Vitran Corp. 'A'	$ 140.68	$ 21.51	6.54
Interpool Inc.	$ 1,002.20	$ 151.18	6.63
Intrenet Inc.	$ 70.23	$ 10.38	6.77
Swift Transportation	$ 835.58	$ 121.34	6.89
Landair Services	$ 212.95	$ 30.38	7.01
CNF Transportation	$ 2,700.69	$ 366.99	7.36
Budget Group Inc	$ 1,247.30	$ 166.71	7.48
Caliber System	$ 2,514.99	$ 333.13	7.55
Knight Transportation Inc	$ 269.01	$ 28.20	9.54
Heartland Express	$ 727.50	$ 64.62	11.26
Greyhound CDA Transn Corp	$ 83.25	$ 6.99	11.91
Mark VII	$ 160.45	$ 12.96	12.38
Coach USA Inc	$ 678.38	$ 51.76	13.11
US 1 Inds Inc.	$ 5.60	$ (0.17)	NA
Average			5.61

A Test on EBITDA

- Ryder System looks very cheap on a Value/EBITDA multiple basis, relative to the rest of the sector. What explanation (other than misvaluation) might there be for this difference?

IV. A Case Study: Internet Stocks in early 2000



PS Ratios and Margins are not highly correlated

- Regressing PS ratios against current margins yields the following

  PS = 81.36 - 7.54(Net Margin) $R^2 = 0.04$

  (0.49)

- This is not surprising. These firms are priced based upon expected margins, rather than current margins.

Solution 1: Use proxies for survival and growth: Amazon in early 2000

- Hypothesizing that firms with higher revenue growth and higher cash balances should have a greater chance of surviving and becoming profitable, we ran the following regression: (The level of revenues was used to control for size)

PS = 30.61 - 2.77 ln(Rev) + 6.42 (Rev Growth) + 5.11 (Cash/Rev)

(0.66) (2.63) (3.49)

R squared = 31.8%

Predicted PS = 30.61 - 2.77(7.1039) + 6.42(1.9946) + 5.11 (.3069) = 30.42

Actual PS = 25.63

Stock is undervalued, relative to other internet stocks.

Solution 2: Use forward multiples

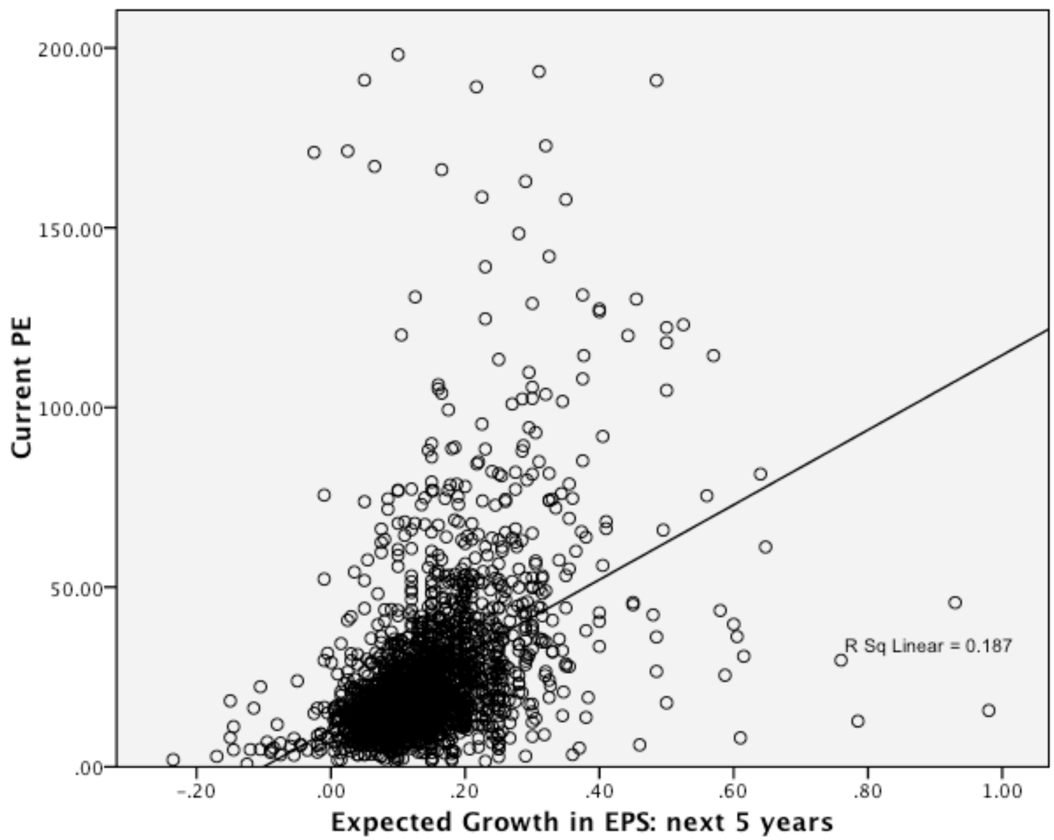
- Global Crossing lost $1.9 billion in 2001 and is expected to continue to lose money for the next 3 years. In a discounted cashflow valuation (see notes on DCF valuation) of Global Crossing, we estimated an expected EBITDA for Global Crossing in five years of $ 1,371 million.
- The average enterprise value/ EBITDA multiple for healthy telecomm firms is 7.2 currently.
- Applying this multiple to Global Crossing's EBITDA in year 5, yields a value in year 5 of
  - Enterprise Value in year 5 = 1371 * 7.2 = $9,871 million
  - Enterprise Value today = $ 9,871 million/ 1.138^5 = $5,172 million

  (The cost of capital for Global Crossing is 13.80%)
  - The probability that Global Crossing will not make it as a going concern is 77%.
  - Expected Enterprise value today = 0.23 (5172) = $1,190 million

Comparisons to the entire market: Why not?

- In contrast to the 'comparable firm' approach, the information in the entire cross-section of firms can be used to predict PE ratios.
- The simplest way of summarizing this information is with a multiple regression, with the PE ratio as the dependent variable, and proxies for risk, growth and payout forming the independent variables.

PE versus Expected EPS Growth: January 2008



PE Ratio: Standard Regression for US stocks - January 2008

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.647[a]	.419	.418	1273.85784

a. Predictors: (Constant), 3-yr Regression Beta, Expected Growth in EPS: next 5 years, Payout Ratio

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.741	.914		2.999	.003
	Expected Growth in EPS: next 5 years	142.627	4.029	.669	35.397	.000
	Payout Ratio	5.668	1.199	.090	4.726	.000
	3-yr Regression Beta	.550	.477	.021	1.153	.249

a. Dependent Variable: Current PE

b. Weighted Least Squares Regression - Weighted by Market Cap

Fundamentals hold in every market: PE regressions across markets…

Region	Regression	R squared
Europe	PE = 14.15 – 2.62 Beta + 7.50 Payout + 29.06 Expected growth rate	17.9%
Japan	PE = 13.55 – 1.25 Beta + 26.05 Payout + 11.87 Expected growth rate	18.4%
Emerging Markets	PE = 5.63 + 11.35 Beta + 2.71 Payout + 92.72 Expected growth rate	13.9%

Market Regressions: Korean Market in 2008

Multiple	Regression	R squared
PBV	PBV = 1.28 + 34.1 ROE +0.51 Beta	46.5%
EV/Sales	EV/Sales = 1.72 -0.72 Beta + 176.9 Operating Margin	16.0%
Price/Sales	PS = 1.27 – 1.71 Beta + 91.5 Net Profit Margin	12.0%

Relative Valuation: Some closing propositions

- Proposition 1: In a relative valuation, all that you are concluding is that a stock is under or over valued, relative to your comparable group.
  - Your relative valuation judgment can be right and your stock can be hopelessly over valued at the same time.
- Proposition 2: In asset valuation, there are no similar assets. Every asset is unique.
  - If you don't control for fundamental differences in risk, cashflows and growth across firms when comparing how they are priced, your valuation conclusions will reflect your flawed judgments rather than market misvaluations.

Choosing Between the Multiples

- As presented in this section, there are dozens of multiples that can be potentially used to value an individual firm.
- In addition, relative valuation can be relative to a sector (or comparable firms) or to the entire market (using the regressions, for instance)
- Since there can be only one final estimate of value, there are three choices at this stage:
  - Use a simple average of the valuations obtained using a number of different multiples
  - Use a weighted average of the valuations obtained using a nmber of different multiples
  - Choose one of the multiples and base your valuation on that multiple

Picking one Multiple

- This is usually the best way to approach this issue. While a range of values can be obtained from a number of multiples, the "best estimate" value is obtained using one multiple.
- The multiple that is used can be chosen in one of two ways:
  - Use the multiple that <u>best fits your objective</u>. Thus, if you want the company to be undervalued, you pick the multiple that yields the highest value.
  - Use the multiple that <u>has the highest R-squared</u> in the sector when regressed against fundamentals. Thus, if you have tried PE, PBV, PS, etc. and run regressions of these multiples against fundamentals, use the multiple that works best at explaining differences across firms in that sector.
  - Use the multiple that seems to <u>make the most sense</u> for that sector, given how value is measured and created.

A More Intuitive Approach

- Managers in every sector tend to focus on specific variables when analyzing strategy and performance. The multiple used will generally reflect this focus. Consider three examples.
  - In retailing: The focus is usually on same store sales (turnover) and profit margins. Not surprisingly, the revenue multiple is most common in this sector.
  - In financial services: The emphasis is usually on return on equity. Book Equity is often viewed as a scarce resource, since capital ratios are based upon it. Price to book ratios dominate.
  - In technology: Growth is usually the dominant theme. PEG ratios were invented in this sector.

In Practice…

- As a general rule of thumb, the following table provides a way of picking a multiple for a sector

Sector	*Multiple Used*	*Rationale*
Cyclical Manufacturing	PE, Relative PE	Often with normalized earnings
High Tech, High Growth	PEG	Big differences in growth across firms
High Growth/No Earnings	PS, VS	Assume future margins will be good
Heavy Infrastructure	EV/EBITDA	Losses/ Big depreciation charges
Financial Services	PBV	Book value often marked to market
Retailing	PS	If leverage is similar across firms
	VS	If leverage is different

Reviewing: The Four Steps to Understanding Multiples

- Define the multiple
  - Check for consistency
  - Make sure that they are estimated uniformly
- Describe the multiple
  - Multiples have skewed distributions: The averages are seldom good indicators of typical multiples
  - Check for bias, if the multiple cannot be estimated
- Analyze the multiple
  - Identify the companion variable that drives the multiple
  - Examine the nature of the relationship
- Apply the multiple

Real Options: Fact and Fantasy

Aswath Damodaran

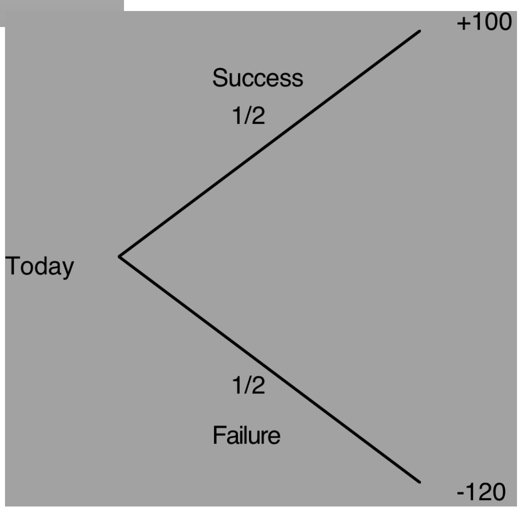
Underlying Theme: Searching for an Elusive Premium

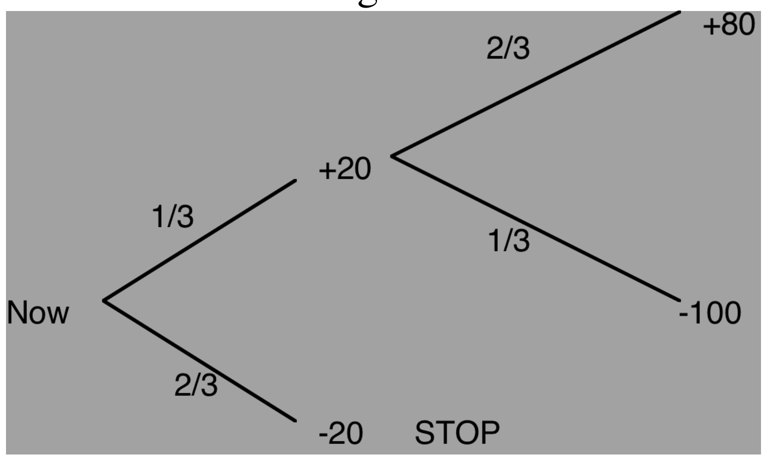
- Traditional discounted cashflow models under estimate the value of investments, where there are options embedded in the investments to
  - Delay or defer making the investment (delay)
  - Adjust or alter production schedules as price changes (flexibility)
  - Expand into new markets or products at later stages in the process, based upon observing favorable outcomes at the early stages (expansion)
  - Stop production or abandon investments if the outcomes are unfavorable at early stages (abandonment)
- Put another way, real option advocates believe that you should be paying a premium on discounted cashflow value estimates.

A Real Option Premium

- In the last few years, there are some who have argued that discounted cashflow valuations under valued some companies and that a real option premium should be tacked on to DCF valuations. To understanding its moorings, compare the two trees below:

A bad investment………………….. Becomes a good one..





1. Learn at relatively low cost
2. Make better decisions based on learning

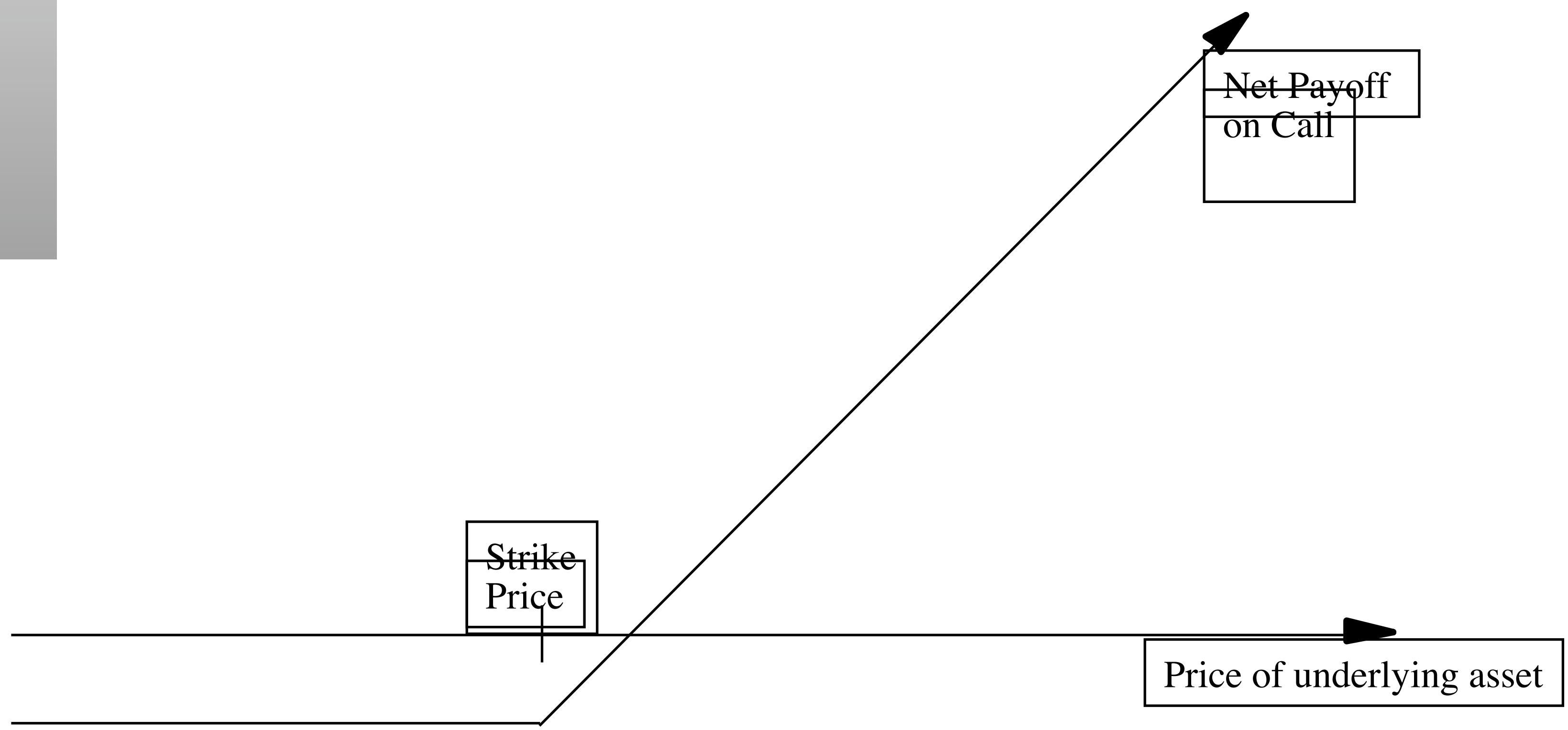
Three Basic Questions

- When is there a real option embedded in a decision or an asset?
- When does that real option have significant economic value?
- Can that value be estimated using an option pricing model?

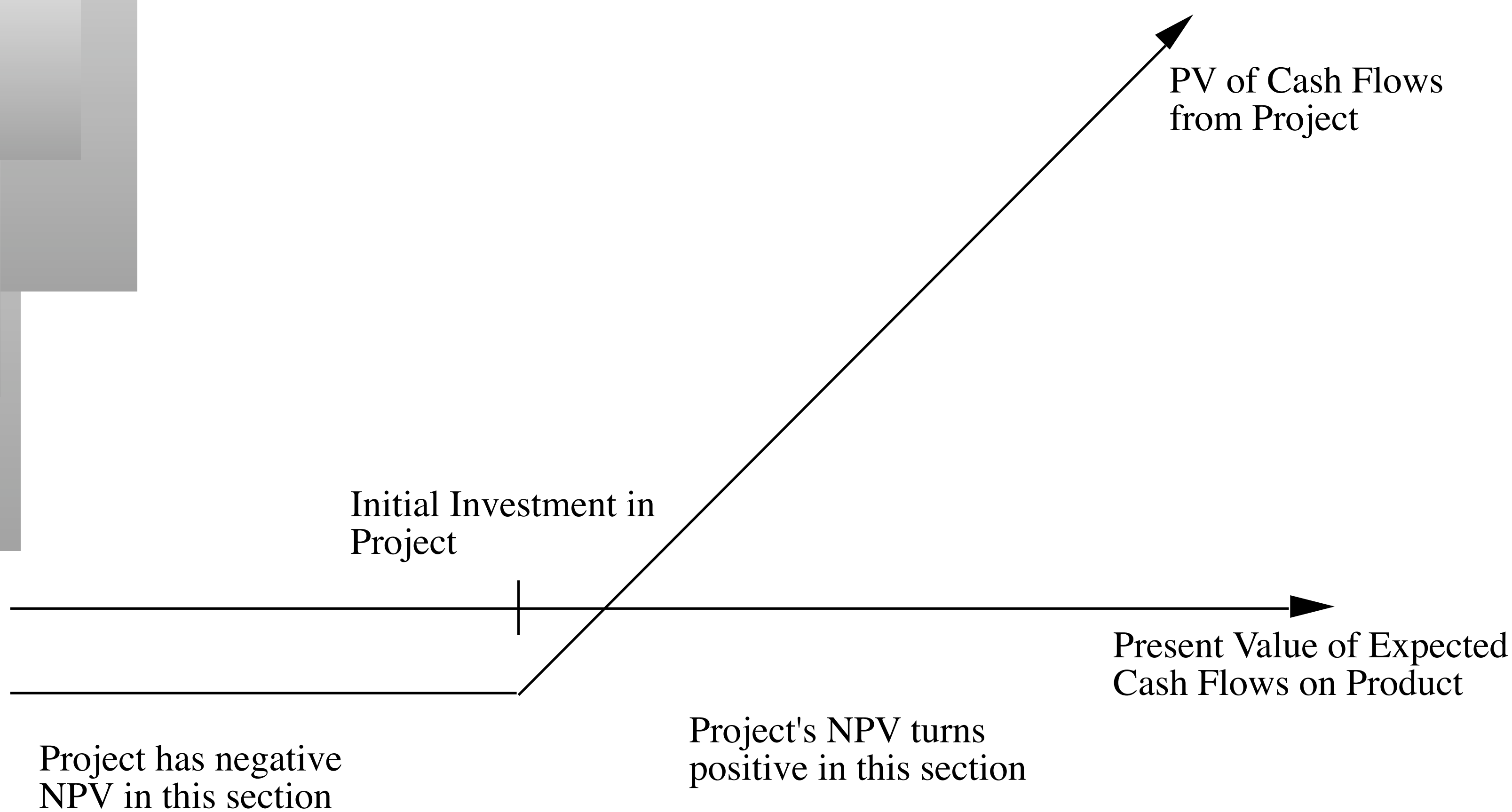
When is there an option embedded in an action?

- An option provides the holder with the **right** to buy or sell a specified quantity of an underlying asset at a fixed price (called a strike price or an exercise price) at or before the expiration date of the option.
- There has to be a clearly defined underlying asset whose value changes over time in unpredictable ways.
- The payoffs on this asset (real option) have to be contingent on an specified event occurring within a finite period.

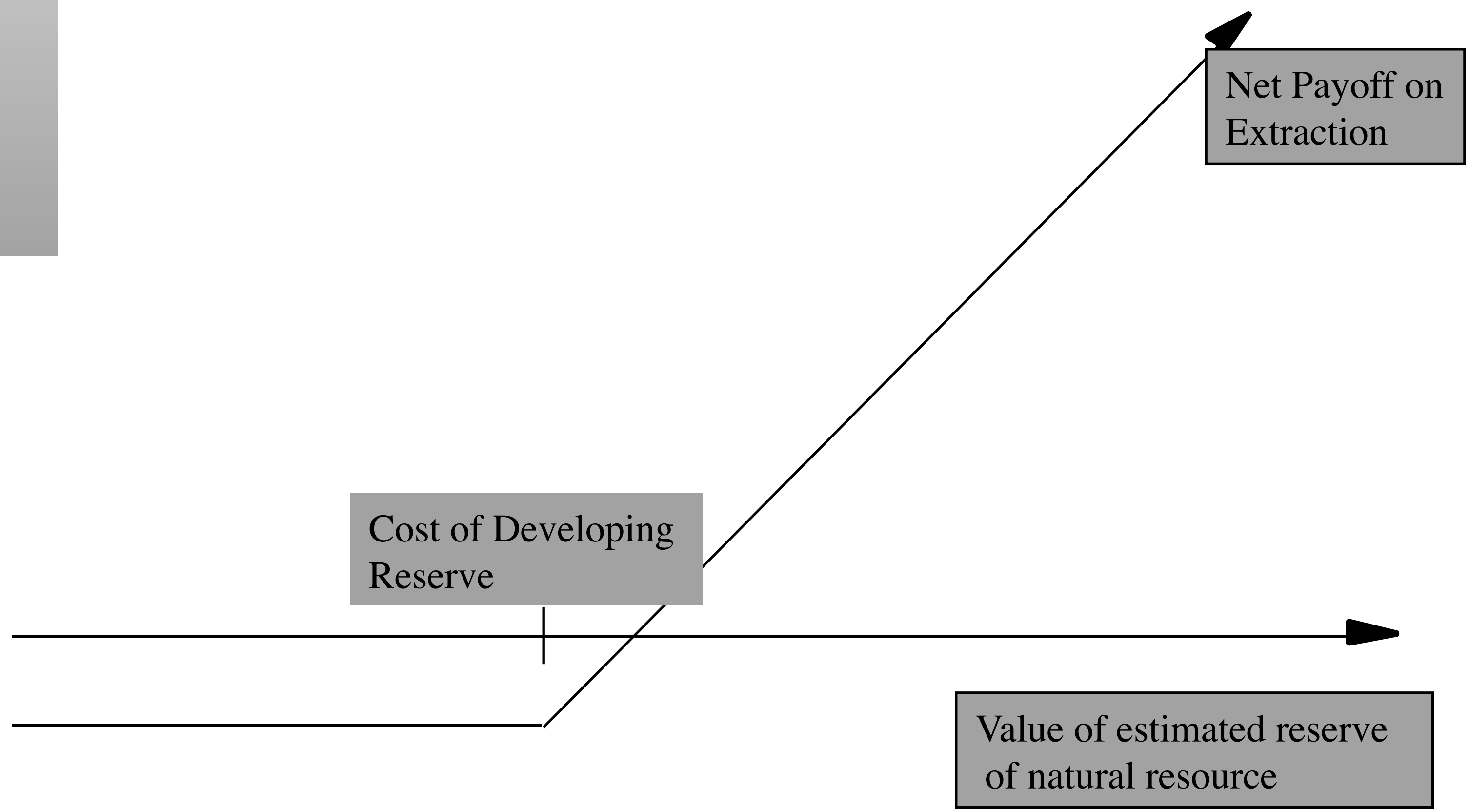
Payoff Diagram on a Call



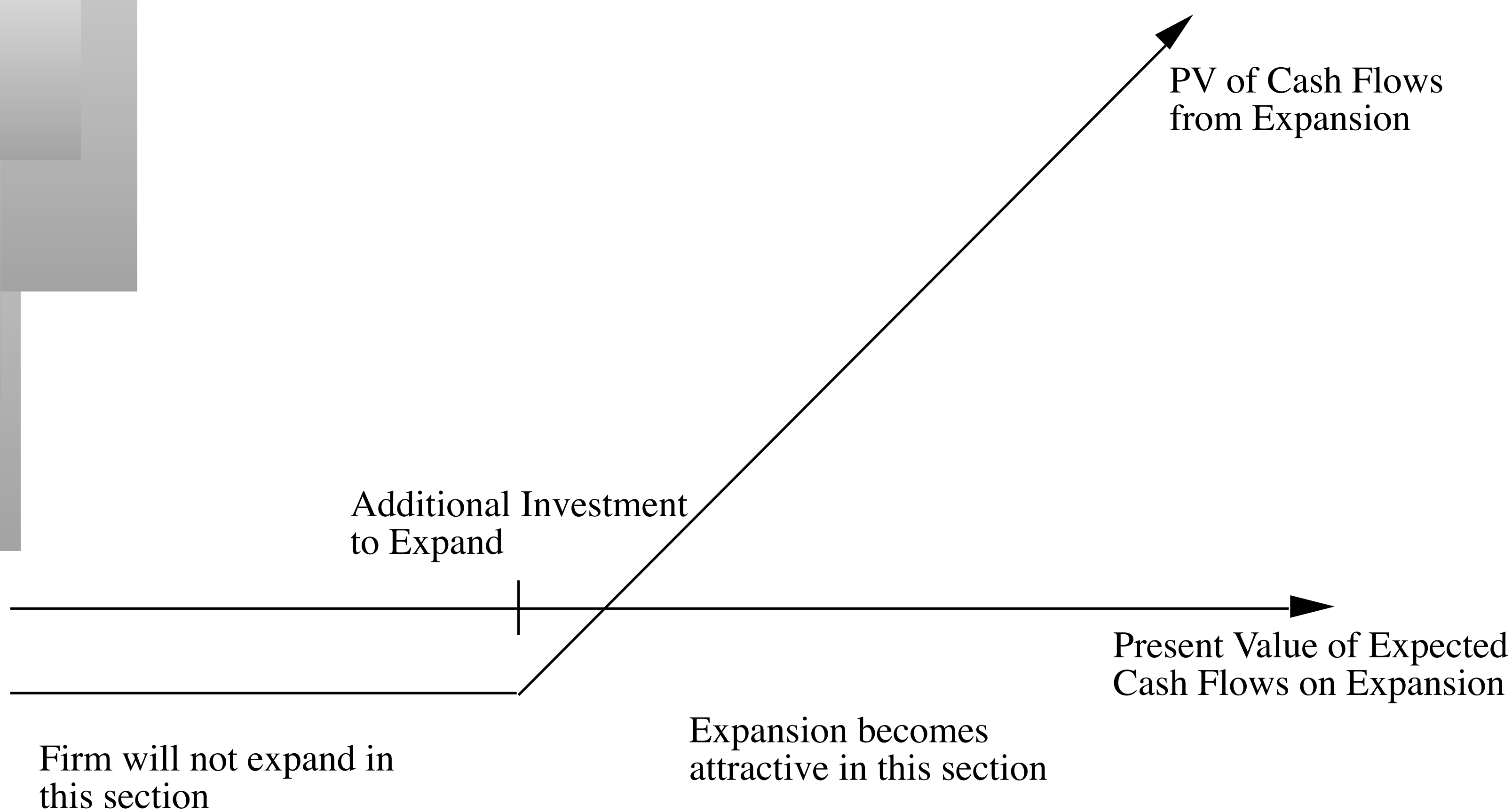
Example 1: Product Patent as an Option



Example 2: Undeveloped Oil Reserve as an option



Example 3: Expansion of existing project as an option



When does the option have significant economic value?

- For an option to have significant economic value, there has to be a restriction on competition in the event of the contingency. In a perfectly competitive product market, no contingency, no matter how positive, will generate positive net present value.
- At the limit, real options are most valuable when you have exclusivity - you and only you can take advantage of the contingency. They become less valuable as the barriers to competition become less steep.

Exclusivity: Putting Real Options to the Test

- Product Options: Patent on a drug
  - Patents restrict competitors from developing similar products
  - Patents do not restrict competitors from developing other products to treat the same disease.
- Natural Resource options: An undeveloped oil reserve or gold mine.
  - Natural resource reserves are limited.
  - It takes time and resources to develop new reserves
- Growth Options: Expansion into a new product or market
  - Barriers may range from strong (exclusive licenses granted by the government - as in telecom businesses) to weaker (brand name, knowledge of the market) to weakest (first mover).

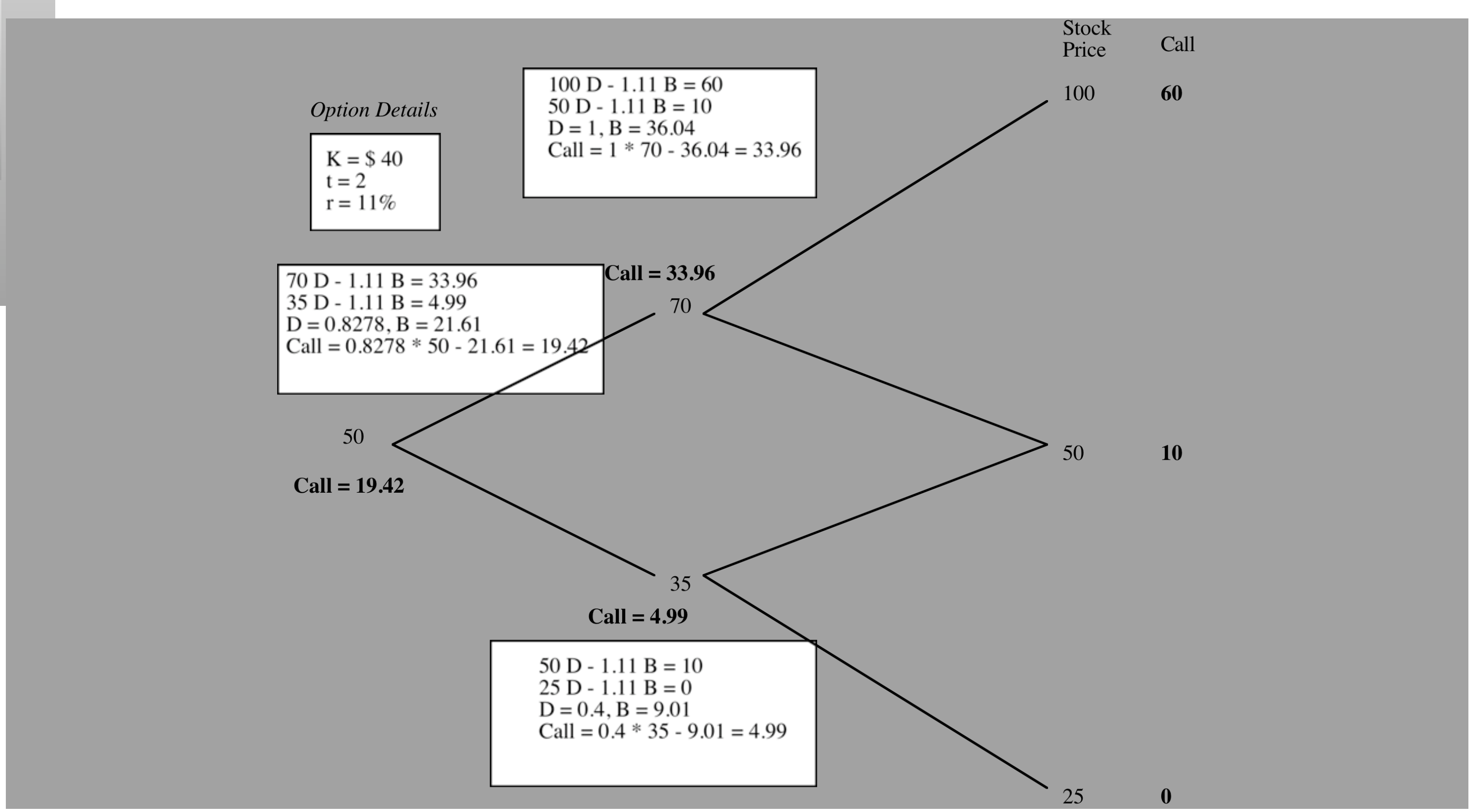
Determinants of option value

- Variables Relating to Underlying Asset
  - Value of Underlying Asset; as this value increases, the right to buy at a fixed price (calls) will become more valuable and the right to sell at a fixed price (puts) will become less valuable.
  - Variance in that value; as the variance increases, both calls and puts will become more valuable because all options have limited downside and depend upon price volatility for upside.
  - Expected dividends on the asset, which are likely to reduce the price appreciation component of the asset, reducing the value of calls and increasing the value of puts.
- Variables Relating to Option
  - Strike Price of Options; the right to buy (sell) at a fixed price becomes more (less) valuable at a lower price.
  - Life of the Option; both calls and puts benefit from a longer life.
- Level of Interest Rates; as rates increase, the right to buy (sell) at a fixed price in the future becomes more (less) valuable.

The Building Blocks for Option Pricing Models: Arbitrage and Replication

- The objective in creating a replicating portfolio is to use a combination of riskfree borrowing/lending and the underlying asset to create the same cashflows as the option being valued.
  - Call = Borrowing + Buying Δ of the Underlying Stock
  - Put = Selling Short Δ on Underlying Asset + Lending
  - The number of shares bought or sold is called the **option delta**.
- The principles of arbitrage then apply, and the value of the option has to be equal to the value of the replicating portfolio.

The Binomial Option Pricing Model



The Limiting Distributions….

- As the time interval is shortened, the limiting distribution, as t -> 0, can take one of two forms.
  - If as t -> 0, **price changes become smaller**, the limiting distribution is the normal distribution and the **price process is a continuous one**.
  - If as t->0, **price changes remain large**, the limiting distribution is the poisson distribution, i.e., a **distribution that allows for price jumps**.
- **The Black-Scholes model** applies when the **limiting distribution is the normal distribution** , and explicitly assumes that the price process is continuous and that there are no jumps in asset prices.

The Black Scholes Model

$$\text{Value of call} = S\, N(d_1) - K\, e^{-rt}\, N(d_2)$$

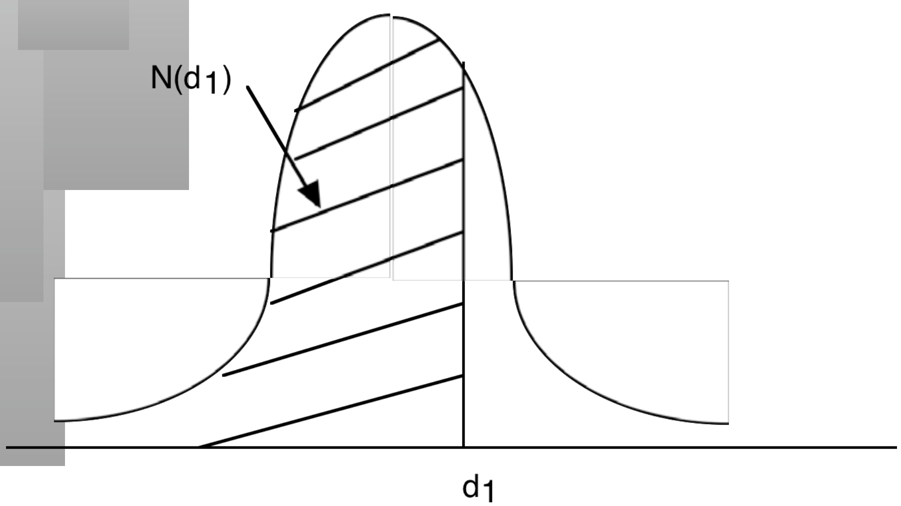
where,

$$d_1 = \frac{\ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right) t}{\sigma \sqrt{t}}$$

- $d_2 = d_1 - \sigma \sqrt{t}$

- The replicating portfolio is embedded in the Black-Scholes model. To replicate this call, you would need to
  - Buy N(d1) shares of stock; N(d1) is called the option delta
  - Borrow $K\, e^{-rt}\, N(d_2)$

The Normal Distribution



d	N(d)	d	N(d)	d	N(d)
-3.00	0.0013	-1.00	0.1587	1.05	0.8531
-2.95	0.0016	-0.95	0.1711	1.10	0.8643
-2.90	0.0019	-0.90	0.1841	1.15	0.8749
-2.85	0.0022	-0.85	0.1977	1.20	0.8849
-2.80	0.0026	-0.80	0.2119	1.25	0.8944
-2.75	0.0030	-0.75	0.2266	1.30	0.9032
-2.70	0.0035	-0.70	0.2420	1.35	0.9115
-2.65	0.0040	-0.65	0.2578	1.40	0.9192
-2.60	0.0047	-0.60	0.2743	1.45	0.9265
-2.55	0.0054	-0.55	0.2912	1.50	0.9332
-2.50	0.0062	-0.50	0.3085	1.55	0.9394
-2.45	0.0071	-0.45	0.3264	1.60	0.9452
-2.40	0.0082	-0.40	0.3446	1.65	0.9505
-2.35	0.0094	-0.35	0.3632	1.70	0.9554
-2.30	0.0107	-0.30	0.3821	1.75	0.9599
-2.25	0.0122	-0.25	0.4013	1.80	0.9641
-2.20	0.0139	-0.20	0.4207	1.85	0.9678
-2.15	0.0158	-0.15	0.4404	1.90	0.9713
-2.10	0.0179	-0.10	0.4602	1.95	0.9744
-2.05	0.0202	-0.05	0.4801	2.00	0.9772
-2.00	0.0228	0.00	0.5000	2.05	0.9798
-1.95	0.0256	0.05	0.5199	2.10	0.9821
-1.90	0.0287	0.10	0.5398	2.15	0.9842
-1.85	0.0322	0.15	0.5596	2.20	0.9861
-1.80	0.0359	0.20	0.5793	2.25	0.9878
-1.75	0.0401	0.25	0.5987	2.30	0.9893
-1.70	0.0446	0.30	0.6179	2.35	0.9906
-1.65	0.0495	0.35	0.6368	2.40	0.9918
-1.60	0.0548	0.40	0.6554	2.45	0.9929
-1.55	0.0606	0.45	0.6736	2.50	0.9938
-1.50	0.0668	0.50	0.6915	2.55	0.9946
-1.45	0.0735	0.55	0.7088	2.60	0.9953
-1.40	0.0808	0.60	0.7257	2.65	0.9960
-1.35	0.0885	0.65	0.7422	2.70	0.9965
-1.30	0.0968	0.70	0.7580	2.75	0.9970
-1.25	0.1056	0.75	0.7734	2.80	0.9974
-1.20	0.1151	0.80	0.7881	2.85	0.9978
-1.15	0.1251	0.85	0.8023	2.90	0.9981
-1.10	0.1357	0.90	0.8159	2.95	0.9984
-1.05	0.1469	0.95	0.8289	3.00	0.9987
-1.00	0.1587	1.00	0.8413		

When can you use option pricing models to value real options?

- The notion of a replicating portfolio that drives option pricing models makes them most suited for valuing real options where
  - The underlying asset is traded - this yield not only observable prices and volatility as inputs to option pricing models but allows for the possibility of creating replicating portfolios
  - An active marketplace exists for the option itself.
  - The cost of exercising the option is known with some degree of certainty.
- When option pricing models are used to value real assets, we have to accept the fact that
  - The value estimates that emerge will be far more imprecise.
  - The value can deviate much more dramatically from market price because of the difficulty of arbitrage.

Valuing a Product Patent as an option: Avonex

- Biogen, a bio-technology firm, has a patent on Avonex, a drug to treat multiple sclerosis, for the next 17 years, and it plans to produce and sell the drug by itself. The key inputs on the drug are as follows:

  PV of Cash Flows from Introducing the Drug Now = S = $ 3.422 billion

  PV of Cost of Developing Drug for Commercial Use = K = $ 2.875 billion

  Patent Life = t = 17 years   Riskless Rate = r = 6.7% (17-year T.Bond rate)

  Variance in Expected Present Values = σ^2 = 0.224 (Industry average firm variance for bio-tech firms)

  Expected Cost of Delay = y = 1/17 = 5.89%

  d1 = 1.1362   N(d1) = 0.8720

  d2 = -0.8512   N(d2) = 0.2076

Call Value= 3,422 $\exp^{(-0.0589)(17)}$ (0.8720) - 2,875 ($\exp^{(-0.067)(17)}$ (0.2076)= $ 907 million

Valuing an Oil Reserve

- Consider an offshore oil property with an estimated oil reserve of 50 million barrels of oil, where the cost of developing the reserve is $ 600 million today.
- The firm has the rights to exploit this reserve for the next twenty years and the marginal value per barrel of oil is $12 per barrel currently (Price per barrel - marginal cost per barrel). There is a 2 year lag between the decision to exploit the reserve and oil extraction.
- Once developed, the net production revenue each year will be 5% of the value of the reserves.
- The riskless rate is 8% and the variance in ln(oil prices) is 0.03.

Valuing an oil reserve as a real option

- Current Value of the asset = S = Value of the developed reserve discounted back the length of the development lag at the dividend yield = $12 * 50 / $(1.05)^2$ = $ 544.22
- (If development is started today, the oil will not be available for sale until two years from now. The estimated opportunity cost of this delay is the lost production revenue over the delay period. Hence, the discounting of the reserve back at the dividend yield)
- Exercise Price = Present Value of development cost = $12 * 50 = $600 million
- Time to expiration on the option = 20 years
- Variance in the value of the underlying asset = 0.03
- Riskless rate =8%
- Dividend Yield = Net production revenue / Value of reserve = 5%

Valuing the Option

- Based upon these inputs, the Black-Scholes model provides the following value for the call:

  d1 = 1.0359   N(d1) = 0.8498

  d2 = 0.2613   N(d2) = 0.6030

- Call Value= 544 .22 $\exp^{(-0.05)(20)}$ (0.8498) -600 ($\exp^{(-0.08)(20)}$ (0.6030)= $ 97.08 million
- This oil reserve, though not viable at current prices, still is a valuable property because of its potential to create value if oil prices go up.
- Extending this concept, the value of an oil company can be written as the sum of three values:

Value of oil company = Value of developed reserves (DCF valuation)

+ Value of undeveloped reserves (Valued as option)

An Example of an Expansion Option

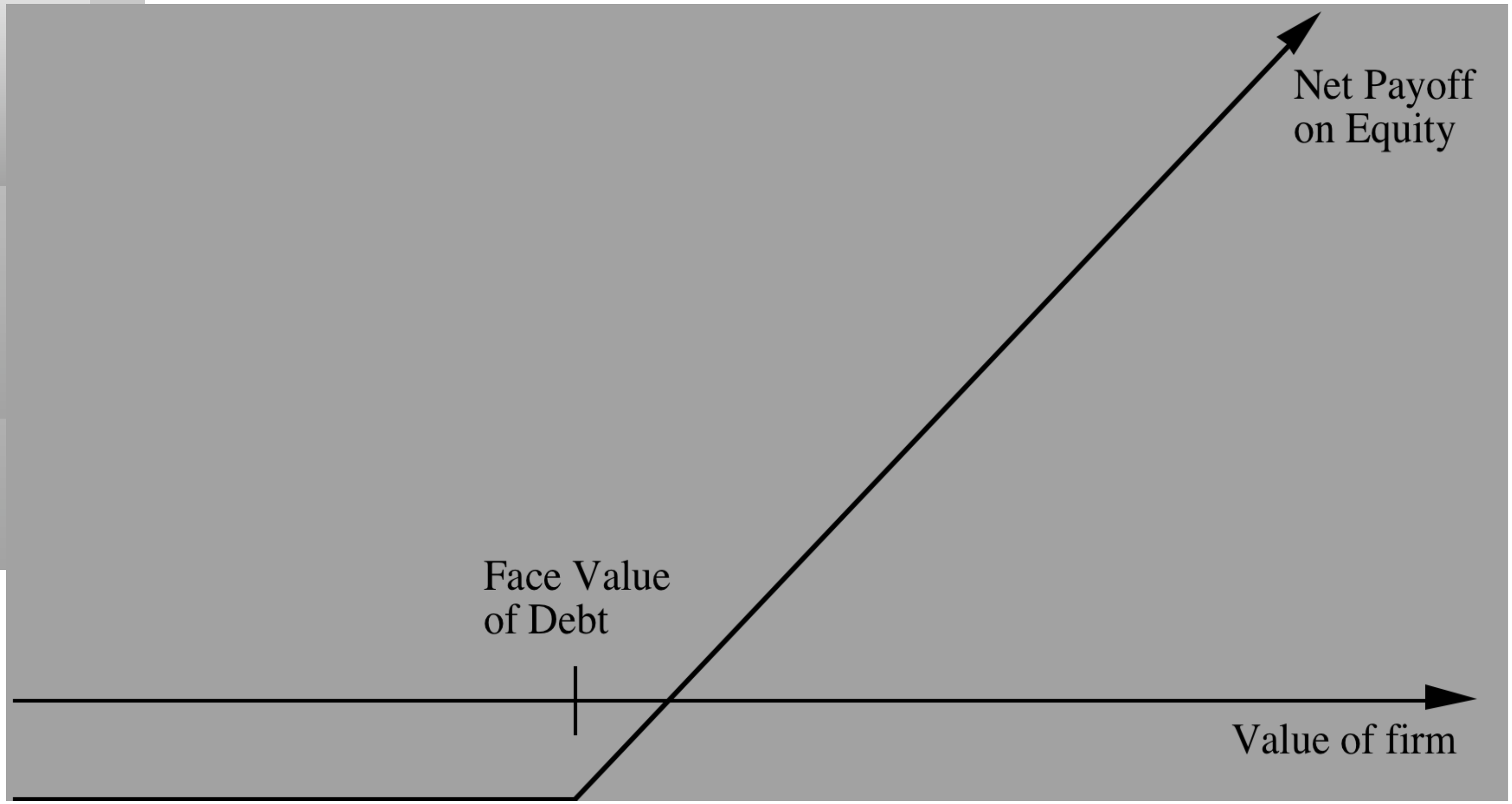
- Ambev is considering introducing a soft drink to the U.S. market. The drink will initially be introduced only in the metropolitan areas of the U.S. and the cost of this “limited introduction” is $ 500 million.
- A financial analysis of the cash flows from this investment suggests that the present value of the cash flows from this investment to Ambev will be only $ 400 million. Thus, by itself, the new investment has a **negative NPV of $ 100 million**.
- If the initial introduction works out well, Ambev **could go ahead with a full-scale introduction to the entire market** with **an additional investment of $ 1 billion** any time over the next 5 years. While the current expectation is that the cash flows from having this investment is only $ 750 million, there is considerable uncertainty about both the potential for the drink, leading to significant variance in this estimate.

Valuing the Expansion Option

- Value of the Underlying Asset (S) = PV of Cash Flows from Expansion to entire U.S. market, if done now =$ 750 Million
- Strike Price (K) = Cost of Expansion into entire U.S market = $ 1000 Million
- We estimate the standard deviation in the estimate of the project value by using the annualized standard deviation in firm value of publicly traded firms in the beverage markets, which is approximately 34.25%.
  - Standard Deviation in Underlying Asset's Value = 34.25%
- Time to expiration = Period for which expansion option applies = 5 years

Call Value= $ 234 Million

One final example: Equity as a Liquidatiion Option



Application to valuation: A simple example

- Assume that you have a firm whose assets are currently valued at \$100 million and that the standard deviation in this asset value is 40%.
- Further, assume that the face value of debt is \$80 million (It is zero coupon debt with 10 years left to maturity).
- If the ten-year treasury bond rate is 10%,
  - how much is the equity worth?
  - What should the interest rate on debt be?

Valuing Equity as a Call Option

- Inputs to option pricing model
  - Value of the underlying asset = S = Value of the firm = \$ 100 million
  - Exercise price = K = Face Value of outstanding debt = \$ 80 million
  - Life of the option = t = Life of zero-coupon debt = 10 years
  - Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.16
  - Riskless rate = r = Treasury bond rate corresponding to option life = 10%
- Based upon these inputs, the Black-Scholes model provides the following value for the call:
  - d1 = 1.5994 N(d1) = 0.9451
  - d2 = 0.3345 N(d2) = 0.6310
- Value of the call = 100 (0.9451) - 80 $\exp^{(-0.10)(10)}$ (0.6310) = \$75.94 million
- Value of the outstanding debt = \$100 - \$75.94 = \$24.06 million
- Interest rate on debt = (\$ 80 / \$24.06)$^{1/10}$ -1 = 12.77%

The Effect of Catastrophic Drops in Value

- Assume now that a catastrophe wipes out half the value of this firm (the value drops to $ 50 million), while the face value of the debt remains at $ 80 million. What will happen to the equity value of this firm?
  - ❑ It will drop in value to $ 25.94 million [$ 50 million - market value of debt from previous page]
  - ❑ It will be worth nothing since debt outstanding > Firm Value
  - ❑ It will be worth more than $ 25.94 million

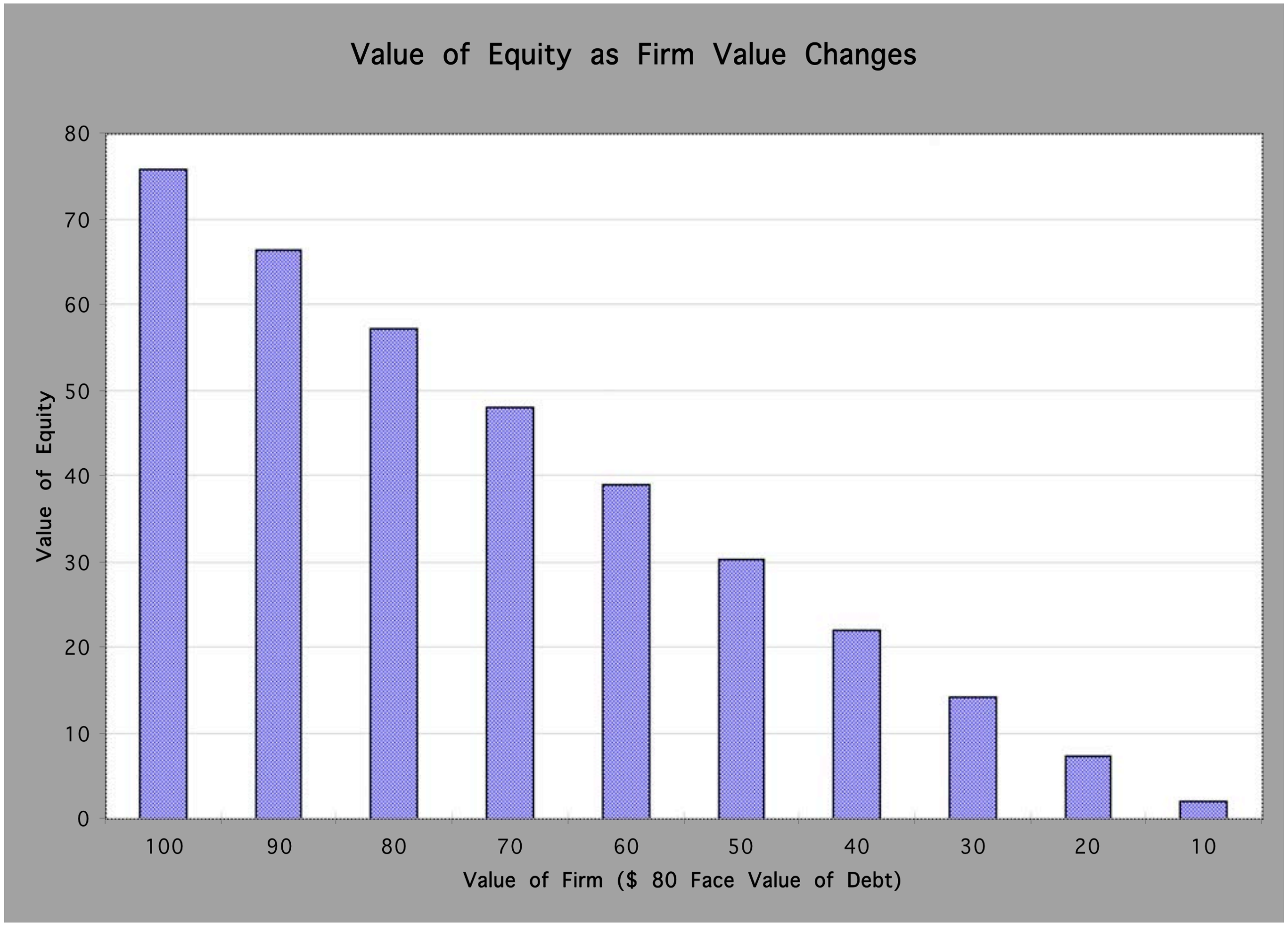
Valuing Equity in the Troubled Firm

- Value of the underlying asset = S = Value of the firm = $ 50 million
- Exercise price = K = Face Value of outstanding debt = $ 80 million
- Life of the option = t = Life of zero-coupon debt = 10 years
- Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.16
- Riskless rate = r = Treasury bond rate corresponding to option life = 10%

The Value of Equity as an Option

- Based upon these inputs, the Black-Scholes model provides the following value for the call:
  - d1 = 1.0515 N(d1) = 0.8534
  - d2 = -0.2135 N(d2) = 0.4155
- Value of the call = 50 (0.8534) - 80 $\exp^{(-0.10)(10)}$ (0.4155) = \$30.44 million
- Value of the bond= \$50 - \$30.44 = \$19.56 million
- The equity in this firm drops by, because of the option characteristics of equity.
- This might explain why stock in firms, which are in Chapter 11 and essentially bankrupt, still has value.

Equity value persists ..



Obtaining option pricing inputs in the real worlds

Input	Estimation Process
Value of the Firm	• Cumulate market values of equity and debt (or) • Value the assets in place using FCFF and WACC (or) • Use cumulated market value of assets, if traded.
Variance in Firm Value	• If stocks and bonds are traded, $\sigma^2_{firm} = w_e^2 \sigma_e^2 + w_d^2 \sigma_d^2 + 2\, w_e w_d \rho_{ed}\, \sigma_e \sigma_d$ where σ_e^2 = variance in the stock price w_e = MV weight of Equity σ_d^2 = the variance in the bond price w_d = MV weight of debt • If not traded, use variances of similarly rated bonds. • Use average firm value variance from the industry in which company operates.
Value of the Debt	• If the debt is short term, you can use only the face or book value of the debt. • If the debt is long term and coupon bearing, add the cumulated nominal value of these coupons to the face value of the debt.
Maturity of the Debt	• Face value weighted duration of bonds outstanding (or) • If not available, use weighted maturity

Valuing Equity as an option - Eurotunnel in early 1998

- Eurotunnel has been a financial disaster since its opening
  - In 1997, Eurotunnel had earnings before interest and taxes of -£56 million and net income of -£685 million
  - At the end of 1997, its book value of equity was -£117 million
- It had £8,865 million in face value of debt outstanding
  - The weighted average duration of this debt was 10.93 years

Debt Type	Face Value	Duration
Short term	935	0.50
10 year	2435	6.7
20 year	3555	12.6
Longer	1940	18.2
Total	*£8,865 mil*	*10.93 years*

The Basic DCF Valuation

- The value of the firm estimated using projected cashflows to the firm, discounted at the weighted average cost of capital was £2,312 million.
- This was based upon the following assumptions –
  - Revenues will grow 5% a year in perpetuity.
  - The COGS which is currently 85% of revenues will drop to 65% of revenues in yr 5 and stay at that level.
  - Capital spending and depreciation will grow 5% a year in perpetuity.
  - There are no working capital requirements.
  - The debt ratio, which is currently 95.35%, will drop to 70% after year 5. The cost of debt is 10% in high growth period and 8% after that.
  - The beta for the stock will be 1.10 for the next five years, and drop to 0.8 after the next 5 years.
  - The long term bond rate is 6%.

Other Inputs

- The stock has been traded on the London Exchange, and the annualized std deviation based upon ln (prices) is 41%.
- There are Eurotunnel bonds, that have been traded; the annualized std deviation in ln(price) for the bonds is 17%.
  - The correlation between stock price and bond price changes has been 0.5. The proportion of debt in the capital structure during the period (1992-1996) was 85%.
  - Annualized variance in firm value

  $= (0.15)^2 (0.41)^2 + (0.85)^2 (0.17)^2 + 2 (0.15) (0.85)(0.5)(0.41)(0.17)= 0.0335$
- The 15-year bond rate is 6%. (I used a bond with a duration of roughly 11 years to match the life of my option)

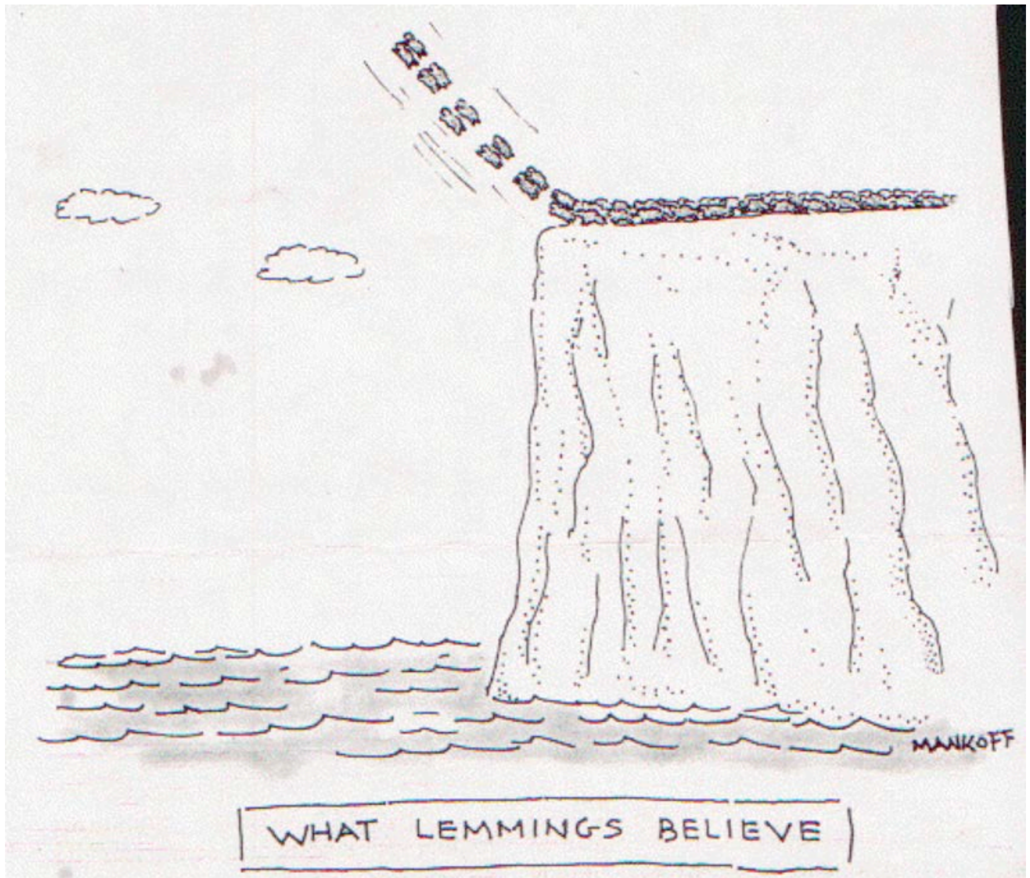
Valuing Eurotunnel Equity and Debt

- Inputs to Model
  - Value of the underlying asset = S = Value of the firm = £2,312 million
  - Exercise price = K = Face Value of outstanding debt = £8,865 million
  - Life of the option = t = Weighted average duration of debt = 10.93 years
  - Variance in the value of the underlying asset = σ^2 = Variance in firm value = 0.0335
  - Riskless rate = r = Treasury bond rate corresponding to option life = 6%
- Based upon these inputs, the Black-Scholes model provides the following value for the call:

  d1 = -0.8337 N(d1) = 0.2023

  d2 = -1.4392 N(d2) = 0.0751
- Value of the call = 2312 (0.2023) - 8,865 $\exp^{(-0.06)(10.93)}$ (0.0751) = £122 million
- Appropriate interest rate on debt = $(8865/2190)^{(1/10.93)}$-1= 13.65%

Back to Lemmings...



VALUATION: IT'S NOT THAT COMPLICATED!

Aswath Damodaran
www.damodaran.com

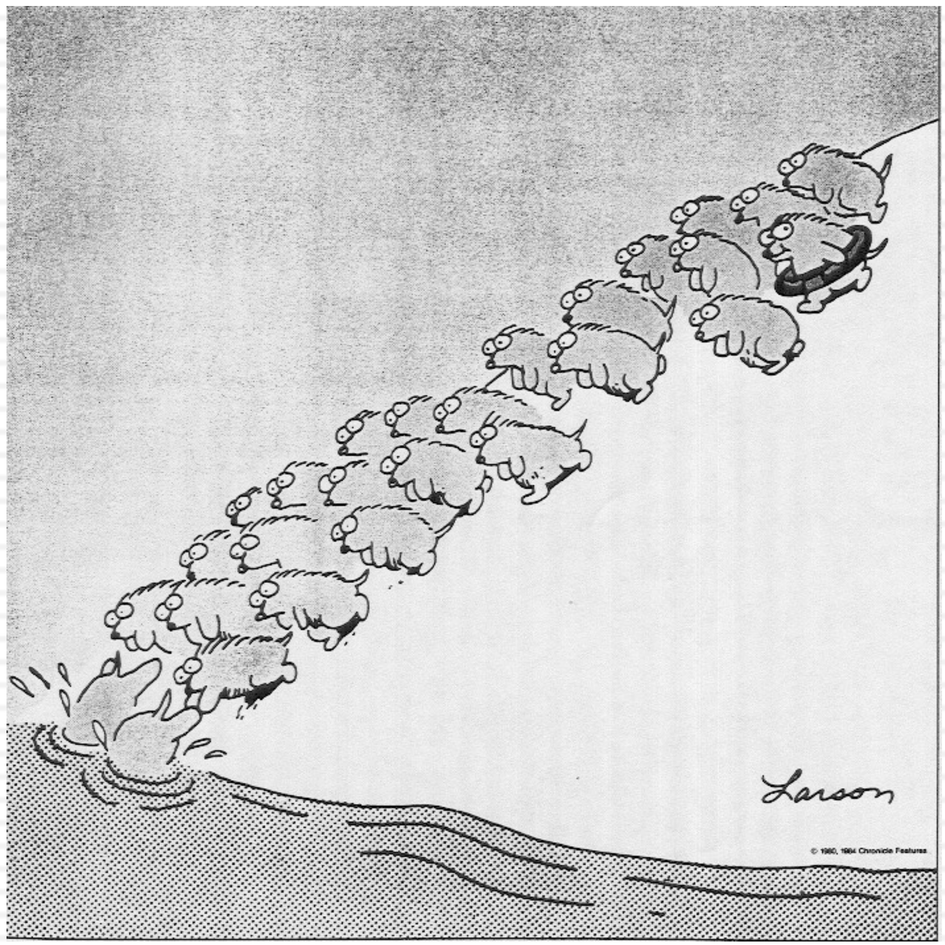
The Big Picture

Just because you have a D and a CF does not mean you have a DCF!

Some Initial Thoughts

" One hundred thousand lemmings cannot be wrong"

Graffiti



Theme 1: Characterizing Valuation as a discipline

- In a science, if you get the inputs right, you should get the output right. The laws of physics and mathematics are universal and there are no exceptions. **Valuation is not a science**.
- In an art, there are elements that can be taught but there is also a magic that you either have or you do not. The essence of an art is that you are either a great artist or you are not. **Valuation is not an art.**
- A craft is a skill that you learn <u>by doing</u>. The more you do it, the better you get at it. **Valuation is a craft.**

Theme 2: Valuing an asset is not the same as pricing that asset

Drivers of intrinsic value
- Cashflows from existing assets
- Growth in cash flows
- Quality of Growth

Drivers of price
- Market moods & momentum
- Surface stories about fundamentals

Accounting Estimates

Valuation Estimates

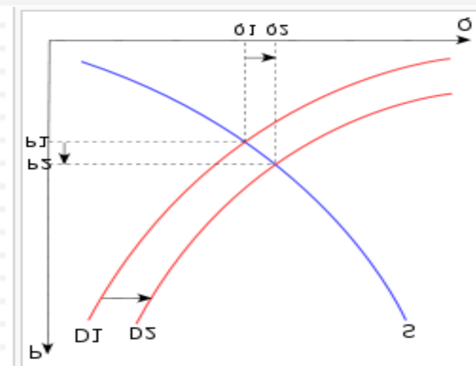
INTRINSIC VALUE

Value

THE GAP
Is there one?
If so, will it close?
If it will close, what will cause it to close?

Price

PRICE



Theme 3: Good valuation = Story + Numbers

Favored Tools
- Accounting statements
- Excel spreadsheets
- Statistical Measures
- Pricing Data

Favored Tools
- Anecdotes
- Experience (own or others)
- Behavioral evidence

A Good Valuation

The Numbers People ⟷ The Narrative People

Illusions/Delusions
1. Precision: Data is precise
2. Objectivity: Data has no bias
3. Control: Data can control reality

Illusions/Delusions
1. Creativity cannot be quantified
2. If the story is good, the investment will be.
3. Experience is the best teacher

Theme 4: If you value something, you should be willing to act on it..

- What theory? There is very little theory in valuation and I am not sure what an academic valuation would like like and am not sure that I want to find out.
- Pragmatism, not purity: The end game is to estimate a value for an asset. I plan to get there, even if it means taking short cuts and making assumptions that would make purists blanch.
- Do you have faith? To act on your valuations, you have to have faith in
  - In your own valuation judgments.
  - In markets: that prices will move towards your value estimates.

That faith will have to be earned.

Misconceptions about Valuation

- Myth 1: A valuation is an objective search for "true" value
  - Truth 1.1: All valuations are biased. The only questions are how much and in which direction.
  - Truth 1.2: The direction and magnitude of the bias in your valuation is directly proportional to who pays you and how much you are paid.
- Myth 2.: A good valuation provides a precise estimate of value
  - Truth 2.1: There are no precise valuations
  - Truth 2.2: The payoff to valuation is greatest when valuation is least precise.
- Myth 3: . The more quantitative a model, the better the valuation
  - Truth 3.1: One's understanding of a valuation model is inversely proportional to the number of inputs required for the model.
  - Truth 3.2: Simpler valuation models do much better than complex ones.

Approaches to Valuation

- **Intrinsic valuation**, relates the value of an asset to the present value of expected future cashflows on that asset. In its most common form, this takes the form of a discounted cash flow valuation.
- **Relative valuation or Pricing**, estimates the value of an asset by looking at the pricing of 'comparable' assets relative to a common variable like earnings, cash flows, book value or sales.
- **Contingent claim valuation**, uses option pricing models to measure the value of assets that share option characteristics.

Discounted Cash Flow Valuation

- *What is it*: In discounted cash flow valuation, the value of an asset is the present value of the expected cash flows on the asset.
- *Philosophical Basis*: Every asset has an intrinsic value that can be estimated, based upon its characteristics in terms of cash flows, growth and risk.
- *Information Needed*: To use discounted cash flow valuation, you need
  - to estimate the life of the asset
  - to estimate the cash flows during the life of the asset
  - to estimate the discount rate to apply to these cash flows to get present value
- *Market Inefficiency*: Markets are assumed to make mistakes in pricing assets across time, and are assumed to correct themselves over time, as new information comes out about assets.

Risk Adjusted Value: Three Basic Propositions

- The value of a risky asset can be estimated by discounting the expected cash flows on the asset over its life at a risk-adjusted discount rate:

$$\text{Value of asset} = \frac{E(CF_1)}{(1+r)} + \frac{E(CF_2)}{(1+r)^2} + \frac{E(CF_3)}{(1+r)^3} \ldots\ldots + \frac{E(CF_n)}{(1+r)^n}$$

1. *The IT Proposition*: If "it" does not affect the cash flows or alter risk (thus changing discount rates), "it" cannot affect value.
2. *The DUH Proposition*: For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.
3. *The DON'T FREAK OUT Proposition*: Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the latter may however have greater growth and higher cash flows to compensate.

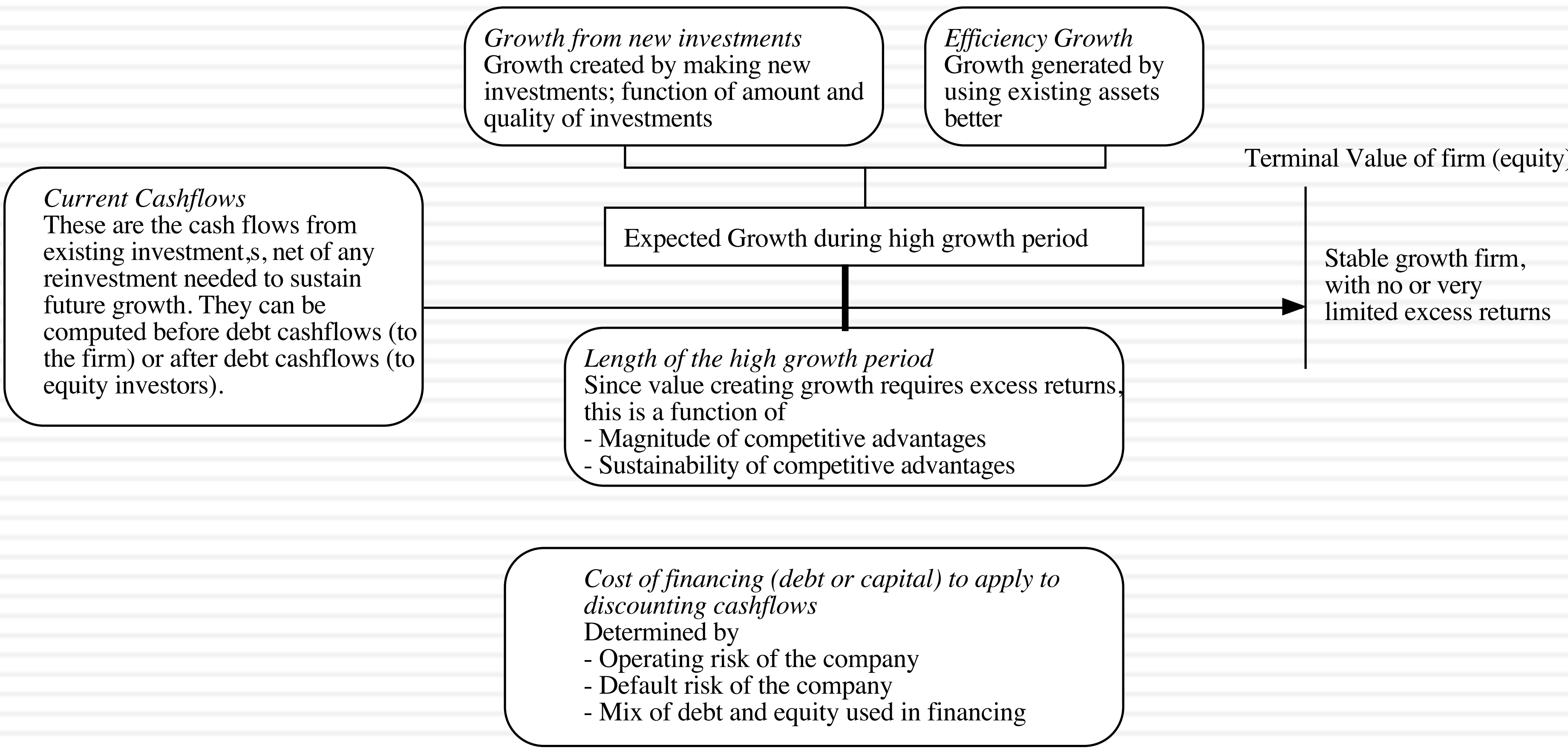
DCF Choices: Equity Valuation versus Firm Valuation

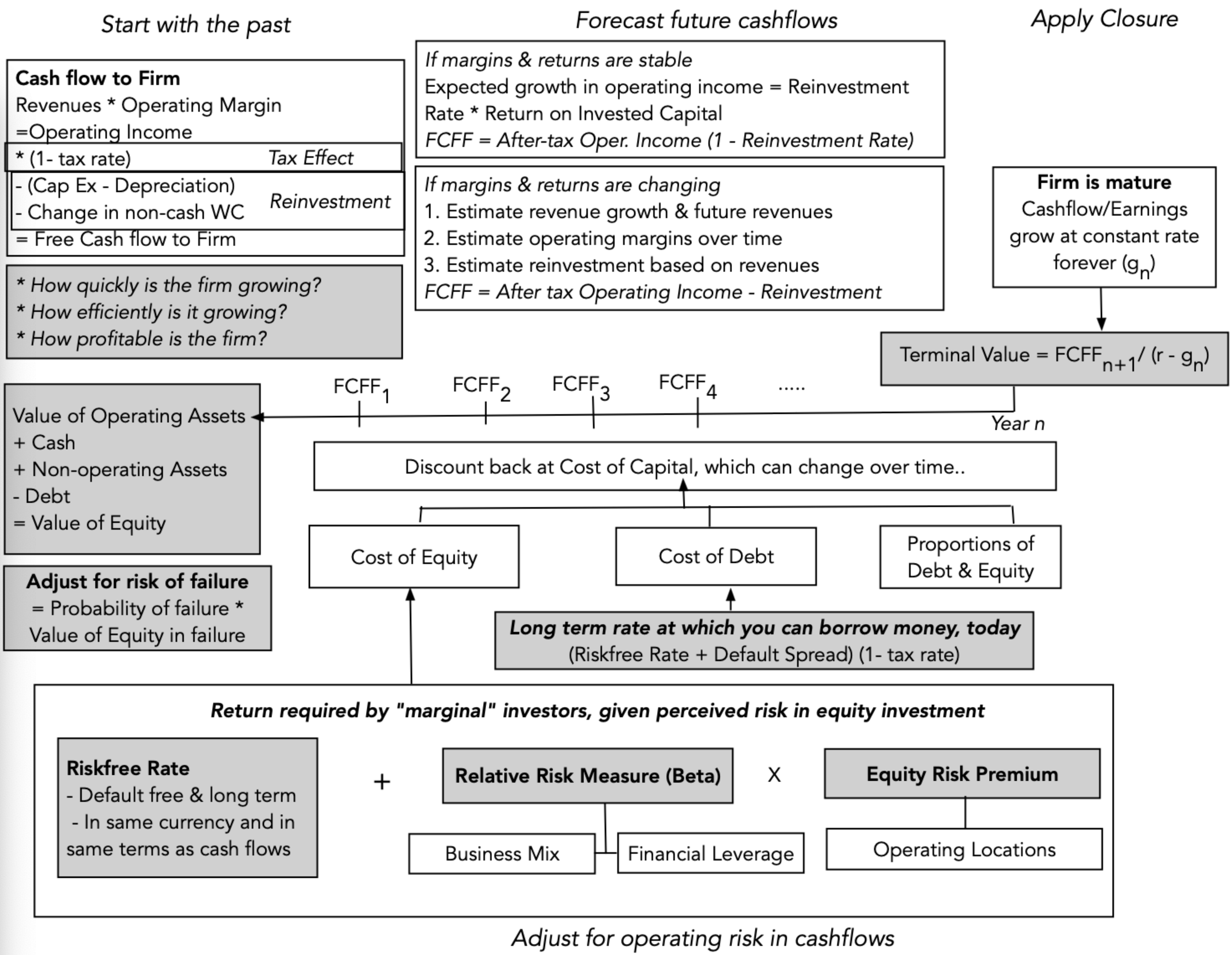
Firm Valuation: Value the entire business

Assets			Liabilities
Existing Investments Generate cashflows today Includes long lived (fixed) and short-lived(working capital) assets	Assets in Place	Debt	Fixed Claim on cash flows Little or No role in management *Fixed Maturity* *Tax Deductible*
Expected Value that will be created by future investments	Growth Assets	Equity	Residual Claim on cash flows Significant Role in management *Perpetual Lives*

Equity valuation: Value just the equity claim in the business

The Drivers of Value…





Start with the past
Forecast future cashflows
Apply Closure
Cash flow to Firm
Revenues * Operating Margin
=Operating Income
* (1- tax rate) Tax Effect
- (Cap Ex - Depreciation)
- Change in non-cash WC
Reinvestment
= Free Cash flow to Firm
* How quickly is the firm growing?
* How efficiently is it growing?
* How profitable is the firm?
If margins & returns are stable
Expected growth in operating income = Reinvestment Rate * Return on Invested Capital
FCFF = After-tax Oper. Income (1 - Reinvestment Rate)
If margins & returns are changing
1. Estimate revenue growth & future revenues
2. Estimate operating margins over time
3. Estimate reinvestment based on revenues
FCFF = After tax Operating Income - Reinvestment
Firm is mature
Cashflow/Earnings grow at constant rate forever (g_n)
Terminal Value = $FCFF_{n+1}/ (r - g_n)$
$FCFF_1$
$FCFF_2$
$FCFF_3$
$FCFF_4$
.....
Year n
Value of Operating Assets
+ Cash
+ Non-operating Assets
- Debt
= Value of Equity
Adjust for risk of failure
= Probability of failure * Value of Equity in failure
Discount back at Cost of Capital, which can change over time..
Cost of Equity
Cost of Debt
Proportions of Debt & Equity
Long term rate at which you can borrow money, today
(Riskfree Rate + Default Spread) (1- tax rate)
Return required by "marginal" investors, given perceived risk in equity investment
Riskfree Rate
- Default free & long term
- In same currency and in same terms as cash flows
+
Relative Risk Measure (Beta)
X
Equity Risk Premium
Business Mix
Financial Leverage
Operating Locations
Adjust for operating risk in cashflows

Amgen: Status Quo

Cap Ex = Acc net Cap Ex(255) + Acquisitions (3975) + R&D (2216)

Current Cashflow to Firm
EBIT(1-t)= :7336(1-**.28**)= 6058
- Nt CpX= 6443
- Chg WC 37
= FCFF - 423
Reinvestment Rate = 6480/6058 =106.98%
Return on capital = 16.71%

Reinvestment Rate
60%

Expected Growth in EBIT (1-t)
.60*.16=.096
9.6%

Return on Capital
16%

Stable Growth
g = 4%; Beta = 1.10;
Debt Ratio= 20%; Tax rate=35%
Cost of capital = 8.08%
ROC= 10.00%;
Reinvestment Rate=4/10=40%

Terminal Value$_{10}$= 7300/(.0808-.04) = 179,099

First 5 years

Growth decreases gradually to 4%

Year	1	2	3	4	5	6	7	8	9	10
EBIT	$9,221	$10,106	$11,076	$12,140	$13,305	$14,433	$15,496	$16,463	$17,306	$17,998
EBIT (1-t)	$6,639	$7,276	$7,975	$8,741	$9,580	$10,392	$11,157	$11,853	$12,460	$12,958
- Reinvestment	$3,983	$4,366	$4,785	$5,244	$5,748	$5,820	$5,802	$5,690	$5,482	$5,183
= FCFF	$2,656	$2,911	$3,190	$3,496	$3,832	$4,573	$5,355	$6,164	$6,978	$7,775

Term Yr
18718
12167
4867
7300

Op. Assets	94214
+ Cash:	1283
- Debt	8272
=Equity	87226
-Options	479
Value/Share	$ 74.33

Cost of Capital (WACC) = 11.7% (0.90) + 3.66% (0.10) = 10.90%

Debt ratio increases to 20%
Beta decreases to 1.10

On May 1,2007, Amgen was trading at $ 55/share

Cost of Equity
11.70%

Cost of Debt
(4.78%+..85%)(1-.35)
= 3.66%

Weights
E = 90% D = 10%

Riskfree Rate:
Riskfree rate = 4.78%

+

Beta
1.73

X

Risk Premium
4%

Unlevered Beta for Sectors: 1.59

D/E=11.06%

Tata Motors: April 2010

Average reinvestment rate from 2005-09: 179.59%; without acquisitions: 70%

Current Cashflow to Firm
EBIT(1-t) : Rs 20,116
- Nt CpX Rs 31,590
- Chg WC Rs 2,732
= FCFF - Rs 14,205
Reinv Rate = (31590+2732)/20116 = 170.61%; Tax rate = 21.00%
Return on capital = 17.16%

Reinvestment Rate
70%

Return on Capital
17.16%

Expected Growth = .70*.1716=0.1201

Stable Growth
g = 5%; Beta = 1.00
Country Premium= 3%
Cost of capital = 10.39%
Tax rate = 33.99%
ROC= 10.39%;
Reinvestment Rate=g/ROC
=5%/ 10.39%= 48.11%

Terminal Value= 23493/(.1039-.05) = Rs 435,686

Rs Cashflows

Year	1	2	3	4	5	6	7	8	9	10
EBIT (1-t)	₹ 22,533	₹ 25,240	₹ 28,272	₹ 31,668	₹ 35,472	₹ 39,236	₹ 42,848	₹ 46,192	₹ 49,150	₹ 51,607
- Reinvestment	₹ 15,773	₹ 17,668	₹ 19,790	₹ 22,168	₹ 24,830	₹ 25,242	₹ 25,138	₹ 24,482	₹ 23,264	₹ 21,503
FCFF	₹ 6,760	₹ 7,572	₹ 8,482	₹ 9,500	₹ 10,642	₹ 13,994	₹ 17,711	₹ 21,710	₹ 25,886	₹ 30,104

45278
21785
23493

Move to effective tax rate causes EBIT (1-t) to drop in terminal year

Op. Assets 210,813
+ Cash: 11418
+ Crosshold 140576
- Debt 109198
=Equity 253,628

Value/Share Rs 614

Discount at Cost of Capital (WACC) = 14.00% (.747) + 8.09% (0.253) = 12.50%

Growth declines to 5% and cost of capital moves to stable period level.

Cost of Equity
14.00%

Cost of Debt
(5%+ 4.25%+3%)(1-.3399)
= 8.09%

Weights
E = 74.7% D = 25.3%

On April 1, 2010
Tata Motors price = Rs 781

Riskfree Rate:
Rs Riskfree Rate= 5%

+

Beta
1.20

X

Mature market premium
4.5%

+

Lambda
0.80

X

Country Equity Risk Premium
4.50%

Unlevered Beta for Sectors: 0.98

Firm's D/E Ratio: 34%

Country Default Spread
3%

X

Rel Equity Mkt Vol
1.50

Fertiglobe: My valuation (October 2022)

Fertiglobe comes into this valuation growing much faster than the typical fertilizer company and will much higher margins.

	Fertiglobe	*All Fertilizer*	*Fertilizer - Largest*
Revenue growth	102.10%	16.00%	21.70%
Operating margin	46.14%	11.83%	22.42%
Sales to Capital	1.79	1.47	1.75

Revenue growth of 50 next year, followed by 15% a year for next 4 years, tapering down to 4% forever.

Between 2018 and 2022 Fertiglobe has almost quadrupled revenue, and in the LTM, the company earned an operating margin of 46.14% and had a sales to capital ratio of 1.79

Pre-tax operating margin decreases to 40.00% over time.

Sales to capital ratio of 1.79, matching company's current

Stable Growth
g = 4%
Cost of capital = 10.10%
ROC= 15%;
Reinvestment Rate= 4%/15% = 26.67%

Terminal Value= 4220/(.101-.04) = $ 70,220

	Base year	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	Terminal year
Revenue growth rate		50.00%	15.00%	15.00%	15.00%	15.00%	12.80%	10.60%	8.40%	6.20%	4.00%	4.00%
Revenues	$4,707	$7,061	$8,120	$9,338	$10,738	$12,349	$13,930	$15,406	$16,700	$17,736	$18,445	$19,183
Operating Margin	46.14%	46.14%	44.92%	44.30%	43.69%	43.07%	42.46%	41.84%	41.23%	40.61%	40.00%	40.00%
Operating Income	$2,172	$3,258	$3,647	$4,137	$4,691	$5,319	$5,914	$6,446	$6,885	$7,203	$7,378	$7,673
Tax rate	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%	19.40%	20.80%	22.20%	23.60%	25.00%	25.00%
EBIT(1-t)	$1,781	$2,672	$2,990	$3,392	$3,847	$4,362	$4,767	$5,106	$5,357	$5,503	$5,533	$5,755
- Reinvestment		$1,315	$592	$680	$782	$900	$883	$825	$723	$578	$396	$1,535
FCFF		$1,357	$2,399	$2,712	$3,064	$3,462	$3,884	$4,281	$4,634	$4,925	$5,137	$4,220

PV(Terminal value)	$ 22,979.04
PV (CF over next 10 years)	$ 17,918.97
Value of operating assets =	$ 40,898.02
- Debt	$ 1,237.00
- Minority interests	$ 685.00
+ Cash	$ 1,589.00
Value of equity	$ 40,565.02
Number of shares	8,301.30
Estimated value /share	$ 4.89
Price	$ 5.32

Cost of capital = 12.85% (.972) + 3.85% (.028) = 12.60%

Cost of capital decreases to 10.01% from years 6-10

On October 17, 2022, the shares were trading at $5.32/share.

Cost of equity = 12.85%

Cost of Debt *Rated B*
(4.00% + 1.14%)(1-.25)
= 3.85%

Weights
E = 97.2% D = 2.8%

Riskfree Rate:
Riskfree rate = 4.00%

+

Beta
1.06

x

Risk Premium
8.33%

Unlevered beta of fertilizer business = 1.04

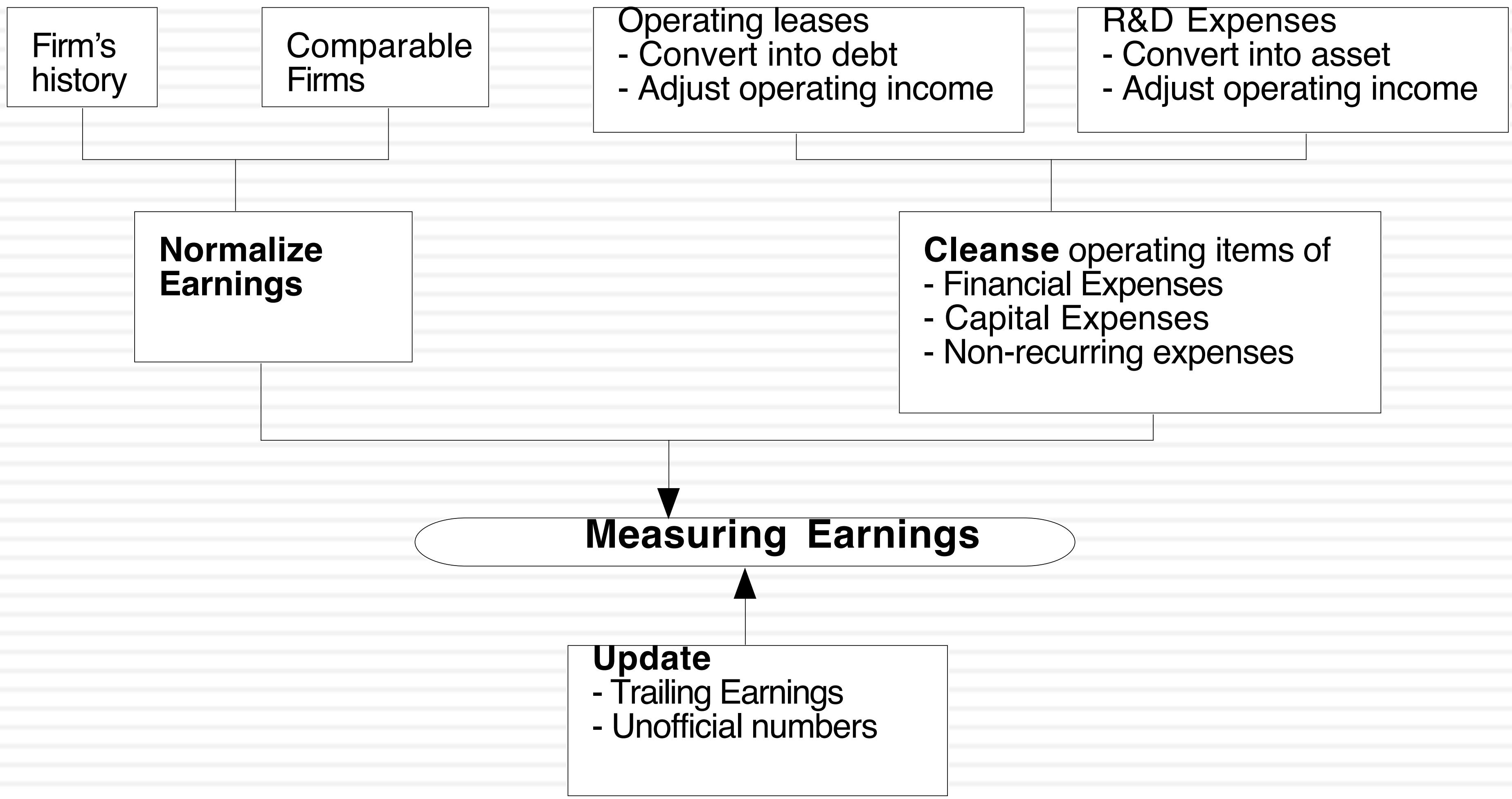
D/E = 2.84%

Region	*Revenues*	*ERP*	*Weight*
Africa	$294	13.37%	8.88%
Asia & Oceania	$1,177	7.57%	35.55%
Central and South America	$476	11.21%	14.38%
Middle East	$61	8.03%	1.84%
North America	$356	6.01%	10.75%
Western Europe	$947	7.17%	28.60%
Total	**$3,311**	**8.33%**	**100.00%**

I. The Nuts and Bolts of D & CF

The details matter, but never as much as you think they do…

I. Measure earnings right..



Operating Leases at Amgen in 2007

- Amgen has lease commitments and its cost of debt (based on it's A rating) is 5.63%.

Year	Commitment	Present Value
1	$96.00	$90.88
2	$95.00	$85.14
3	$102.00	$86.54
4	$98.00	$78.72
5	$87.00	$66.16
6-12	$107.43	$462.10 ($752 million prorated)

- Debt Value of leases = $869.55
- Debt outstanding at Amgen = $7,402 + $ 870 = $8,272 million
- Adjusted Operating Income = Stated OI + Lease expense this year – Depreciation

  = 5,071 m + 69 m - 870/12 = $5,068 million (12 year life for assets)
- Approximate Operating income= stated OI + PV of Lease commitment * Pre-tax cost of debt

= $5,071 m + 870 m (.0563) = $ 5,120 million

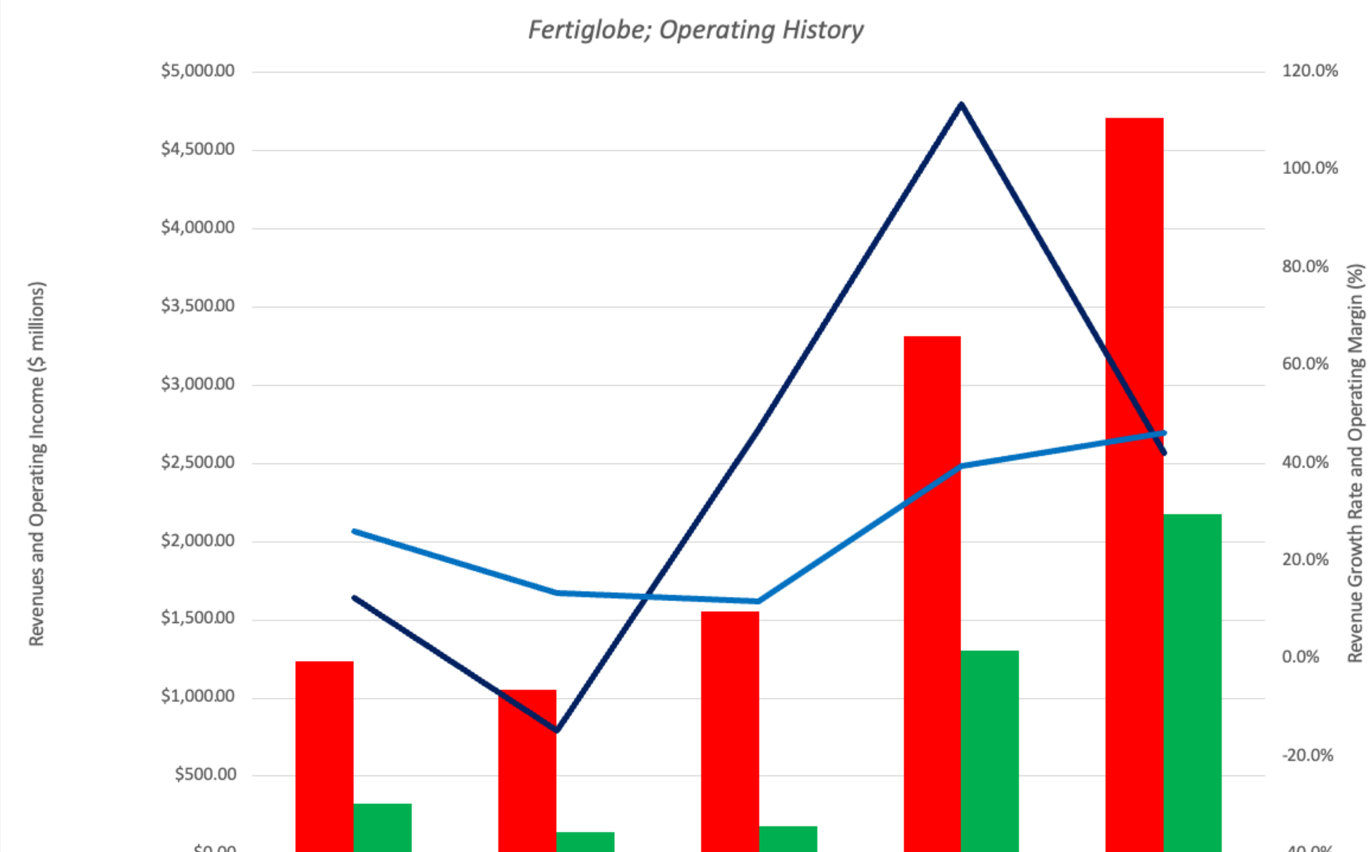
Capitalizing R&D Expenses: Amgen

- R & D was assumed to have a 10-year life.

Year	R&D Expense	Unamortized portion		Amortization this year
Current	3366.00	1.00	3366.00	
-1	2314.00	0.90	2082.60	$231.40
-2	2028.00	0.80	1622.40	$202.80
-3	1655.00	0.70	1158.50	$165.50
-4	1117.00	0.60	670.20	$111.70
-5	865.00	0.50	432.50	$86.50
-6	845.00	0.40	338.00	$84.50
-7	823.00	0.30	246.90	$82.30
-8	663.00	0.20	132.60	$66.30
-9	631.00	0.10	63.10	$63.10
-10	558.00		0.00	$55.80
Value of Research Asset =			$10,112.80	$1,149.90

- Adjusted Operating Income = $5,120 + 3,366 - 1,150 = $7,336 million

Fertiglobe: Operating History



	2018	2019	2020	2021	2022
Revenues	$1,237.50	$1,055.50	$1,550.80	$3,310.70	$4,706.80
Operating Income	$322.00	$142.20	$181.60	$1,304.60	$2,172.40
Revenue Growth Rate	12.5%	-14.71%	46.93%	113.48%	42.17%
Operating Margin	26.02%	13.47%	11.71%	39.41%	46.15%

II. Get the big picture (not the accounting one) when it comes to cap ex and working capital

- Capital expenditures should include
  - Research and development expenses, once they have been re-categorized as capital expenses.
  - Acquisitions of other firms, whether paid for with cash or stock.
- Working capital should be defined not as the difference between current assets and current liabilities but as the difference between non-cash current assets and non-debt current liabilities.
- On both items, start with what the company did in the most recent year but do look at the company's history and at industry averages.

Amgen's Net Capital Expenditures

- The accounting net cap ex at Amgen is small:
  - Accounting Capital Expenditures = $1,218 million
  - - Accounting Depreciation = $ 963 million
  - Accounting Net Cap Ex = $ 255 million
- We define capital expenditures broadly to include R&D and acquisitions:
  - Accounting Net Cap Ex = $ 255 million
  - Net R&D Cap Ex = (3366-1150) = $2,216 million
  - Acquisitions in 2006 = $3,975 million
  - Total Net Capital Expenditures = $ 6,443 million
- Acquisitions have been a volatile item. Amgen was quiet on the acquisition front in 2004 and 2005 and had a significant acquisition in 2003.

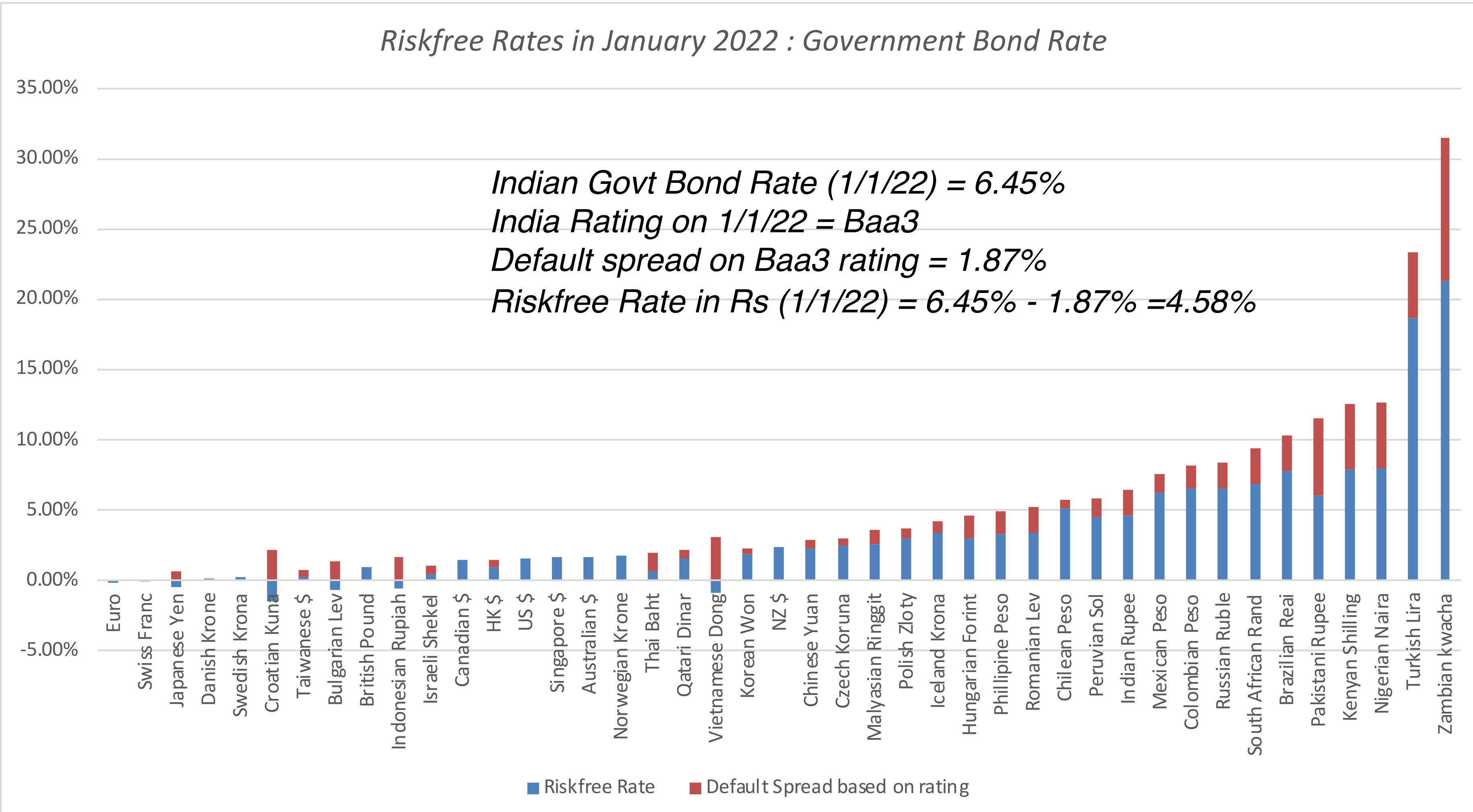
III. The government bond rate is not always the riskfree rate

- When valuing Amgen in US dollars, the US$ ten-year bond rate of 4.78% was used as the risk free rate. We assumed that the US treasury was default free.
- When valuing Tata Motors in Indian rupees in 2010, the Indian government bond rate of 8% was not default free. Using the Indian government's local currency rating of Ba2 yielded a default spread of 3% for India and a riskfree rate of 5% in Indian rupees.

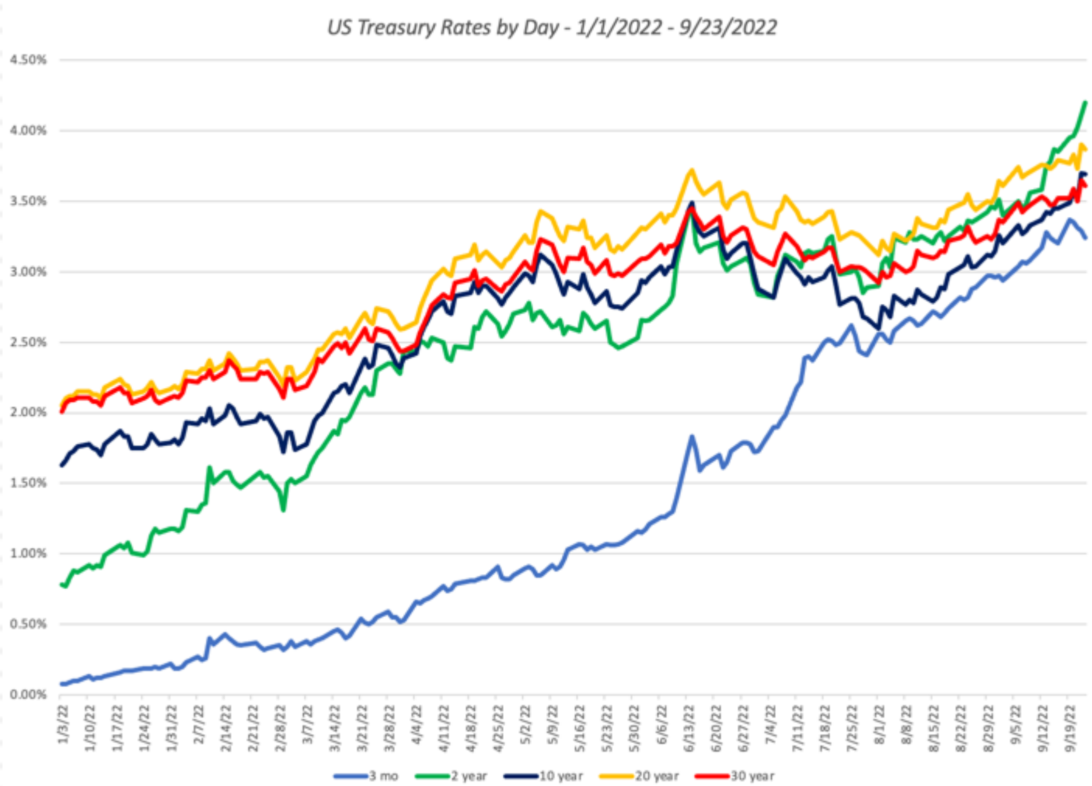
    Risk free rate in Indian Rupees = 8% - 3% = 5%

- To value Fertiglobe in March 2022, you need a risk free rate in UAE Dirham at the time. Assuming that the peg to the US dollar is sustainable, we switched and valued the company in US dollars. The risk free rate is the US treasury bond of 4%.

Risk free rates will vary across currencies!



And across time…



Date	3 mo	2 year	10 year	20 year	30 year
1/1/22	0.08%	0.78%	1.63%	2.05%	2.01%
4/1/22	0.53%	2.44%	2.39%	2.60%	2.44%
7/1/22	1.73%	2.84%	2.88%	3.35%	3.11%
9/23/22	3.24%	4.20%	3.69%	3.87%	3.61%
Change: 1/1-9/23	3.16%	3.42%	2.06%	1.82%	1.60%

Risk free Rates in Currencies without a Government Bond Rate

- There are no traded long term Government bonds in some currencies. Hence, you have to improvise.
- One simple technique is to use differential inflation and the US dollar risk free rate. Using this technique on the Egyptian pound, here is what you get:
  - Risk free rate in US dollars on 12/31/15 = 2.27%
  - Expected inflation rate in the US = 1.50%
  - Expected inflation rate in Egypt = 9.70% (last year's estimate)
  - Risk free rate in EGP = (1.0227) * (1.097/1.015) -1 =10.53%
- This is also a good way to check government bond rates that you do not trust. For instance, the Venezuelan government bond rate of 19% on January 1, 2019, is pure fiction, since no rational person would have bought the bonds with the interest rate (given that inflation was in >5000%).

But valuations should not! Infosys Valuation in 2018

	In Rupees	In Dollars
Risk free Rate	5.38%	2.85%
Expected growth rate	10.00% for next 5 years, scaling down to 5.38% in year 10 (and forever)	7.37% for next 5 years, scaling down to 2.85% in year 10 (and forever)
Return on Capital	Marginal ROIC of 39.70%, scaling down to 15% forever	Marginal ROIC of 37.68%, scaling down to 12.36% forever.
Cost of capital	11.02% for next 5 years, scaling down to 9.88% in year 10 (and beyond)	8.36% for next 5 years, scaling down to 7.23% in year 10 (and beyond)
Value per share	Rs 1072.22 per share about 7% below stock price of Rs 1,150/share	$16.86 per share about 7% below stock price of $18.02/share

Heineken: September 2019 (in Euros)

Cash flows from existing assets

	LTM	2013-2018
Revenues	€ 23,119	Growth rate = 3.22%
Operating Margin	14.86%	14.44%
Sales/Invested Capital	0.71	0.79
ROIC	7.46%	8.32%
Effective Tax Rate	29.70%	27.00%

The Payoff from growth

Revenues will grow 3.22% a year for next 5 years, tapering down to -0.5% growth in year 10

Operatng margin (per-tax) will drop to 14.00%

Sales/Invested Capital will stay at five-year average of 0.79.

Maturty and Closure

Stable Growth
g = -0.5%;
Cost of capital = 5%
ROC= 5%;
Reinvestment Rate=-.5%/5% = -10%

Terminal Value = 2972/(.05-..-(.005)) = 54,034

Euro Cashflows

	1	2	3	4	5	6	7	8	9	10	Terminal year
Revenue growth rate	3.22%	3.22%	3.22%	3.22%	3.22%	2.48%	1.73%	0.99%	0.24%	-0.50%	-0.50%
Revenues	€ 23,863	€ 24,632	€ 25,425	€ 26,244	€ 27,089	€ 27,759	€ 28,240	€ 28,519	€ 28,589	€ 28,446	€ 28,304
EBIT (Operating) margin	14.38%	14.34%	14.30%	14.26%	14.21%	14.17%	14.13%	14.09%	14.04%	14.00%	14.00%
EBIT (Operating income)	€ 3,432	€ 3,532	€ 3,635	€ 3,741	€ 3,850	€ 3,934	€ 3,990	€ 4,017	€ 4,015	€ 3,982	$ 3,963
Tax rate	29.70%	29.70%	29.70%	29.70%	29.70%	28.76%	27.82%	26.88%	25.94%	25.00%	$ 0
EBIT(1-t)	€ 2,413	€ 2,483	€ 2,556	€ 2,630	€ 2,707	€ 2,802	€ 2,880	€ 2,937	€ 2,973	€ 2,987	$ 2,972
- Reinvestment	€ 942	€ 973	€ 1,004	€ 1,036	€ 1,070	€ 849	€ 609	€ 353	€ 88	€ (181)	$ (297)
FCFF	€ 1,471	€ 1,511	€ 1,552	€ 1,594	€ 1,637	€ 1,953	€ 2,271	€ 2,584	€ 2,885	€ 3,168	$ 3,269

PV(Terminal value)	€ 36,390.85
PV (CF over next 10 years)	€ 15,300.34
Value of operating assets =	€ 51,691.19
- Debt	€ 19,709.52
- Minority interests	€ 1,069.00
+ Cash	€ 1,751.60
+ Non-operating assets	€ 1,401.00
Value of equity	€ 34,065.26
Number of shares	571.10
Estimated value /share	€ 59.65
Price	€ 93.25
Price as % of value	56.33%

Discount at Euro Cost of Capital (WACC) = 7.66% (.599) + 1.13% (0.401) = 5.04%

The Risk in the Cash flows

On September 1, 2019, Heineken was trading at 93.25 Euros/share

Cost of Equity 7.66%

Cost of Debt
(-0.5%+2%)(1-.25) = 1.13%

Weights
E = 59.9% D = 40.1%

Riskfree Rate:
Euro Risk free rate = -0.50%

+

Beta = 1.20

X

Firm's D/E Ratio: 66.98%

Unlevered beta of alcoholic beverage business = 0.80

ERP = 6.83%

Region	Revenues	Weight	ERP
Europe	10348	50.24%	6.90%
North America	5920	28.74%	5.75%
Asia	2919	14.17%	7.22%
Latin America & Caribbean	781	3.79%	10.53%
Africa & Mid East	631	3.06%	9.30%
Total	**20599**	**100.00%**	**6.83%**

Arcelik: My valuation (October 2019)

Arcelik's revenue growth has been solid and its margins have been high, but return on capital has been less that the cost of capital

	LTM	*2014-2019*	*Industry Average*
Revenue Growth	37.03%	20.14%	7.83%
Pre-tax Operating Margin	7.82%	7.70%	7.93%
ROIC	11.70%	12.74%	18.68%
Sales/Capital	1.70	1.77	2.73

Between 2014 and 2019, Arcelik reported a growth rate of 20.14% in revenues, an average operating margin of 7.70% and an average sales to capital ratio of 1.77.

Stable Growth
g = 10%
Cost of capital = 15%
ROC= 15%;
Reinvestment Rate= 10%/15% = 66.67%

Revenue growth of 20% a year for 5 years, tapering down to 10% in year 10

Pre-tax operating margin increases to 8.00% over time.

Sales to capital ratio of 2.73, matching global average

Terminal Value= 3,332/(.15-.10) = TL 66,633

PV(Terminal value)	$11,766.68
PV (CF over next 10 years)	$ 3,603.22
Value of operating assets =	$15,369.90
- Debt	$14,305.92
- Minority interests	$ 114.60
+ Cash	$ 6,026.00
+ Non-operating assets	$ 481.10
Value of equity	$ 7,456.48
Number of shares	675.70
Estimated value /share	$ 11.04

	Base year	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	Terminal year
Revenue growth rate		20.00%	20.00%	20.00%	20.00%	20.00%	18.00%	16.00%	14.00%	12.00%	10.00%	10.00%
Revenues	30,440 ₺	36,528 ₺	43,834 ₺	52,600 ₺	63,120 ₺	75,744 ₺	89,378 ₺	103,679 ₺	118,194 ₺	132,377 ₺	145,615 ₺	160,177 ₺
EBIT (Operating) margin	7.82%	7.84%	7.86%	7.88%	7.89%	7.91%	7.93%	7.95%	7.96%	7.98%	8.00%	8.00%
EBIT (Operating income)	2,381 ₺	2,864 ₺	3,444 ₺	4,143 ₺	4,982 ₺	5,992 ₺	7,087 ₺	8,239 ₺	9,413 ₺	10,567 ₺	11,649 ₺	12,814 ₺
Tax rate	14.80%	14.80%	14.80%	14.80%	14.80%	14.80%	16.24%	17.68%	19.12%	20.56%	22.00%	22.00%
EBIT(1-t)	2,029 ₺	2,440 ₺	2,935 ₺	3,529 ₺	4,245 ₺	5,105 ₺	5,936 ₺	6,782 ₺	7,614 ₺	8,394 ₺	9,086 ₺	9,995 ₺
- Reinvestment		2,226 ₺	2,672 ₺	3,206 ₺	3,847 ₺	4,616 ₺	4,986 ₺	5,230 ₺	5,308 ₺	5,187 ₺	4,841 ₺	6,663 ₺
FCFF		214 ₺	263 ₺	324 ₺	398 ₺	489 ₺	950 ₺	1,553 ₺	2,306 ₺	3,208 ₺	4,246 ₺	3,332 ₺

Cost of capital = 24.73% (.522) + 16.01% (.478) = 20.64%

Cost of capital decreases to 15% from years 6-10

On October 14, 2019, the shares were trading at 18 TL/share.

Cost of equity = 24.73%

Cost of Debt *Rated B*
(11.06%+4.06%+5.40%)(1-.25) = 16.01%

Weights
E = 52.2% D = 47.8%

Riskfree Rate:
Riskfree rate = 11.06%

\+

Beta
1.69

X

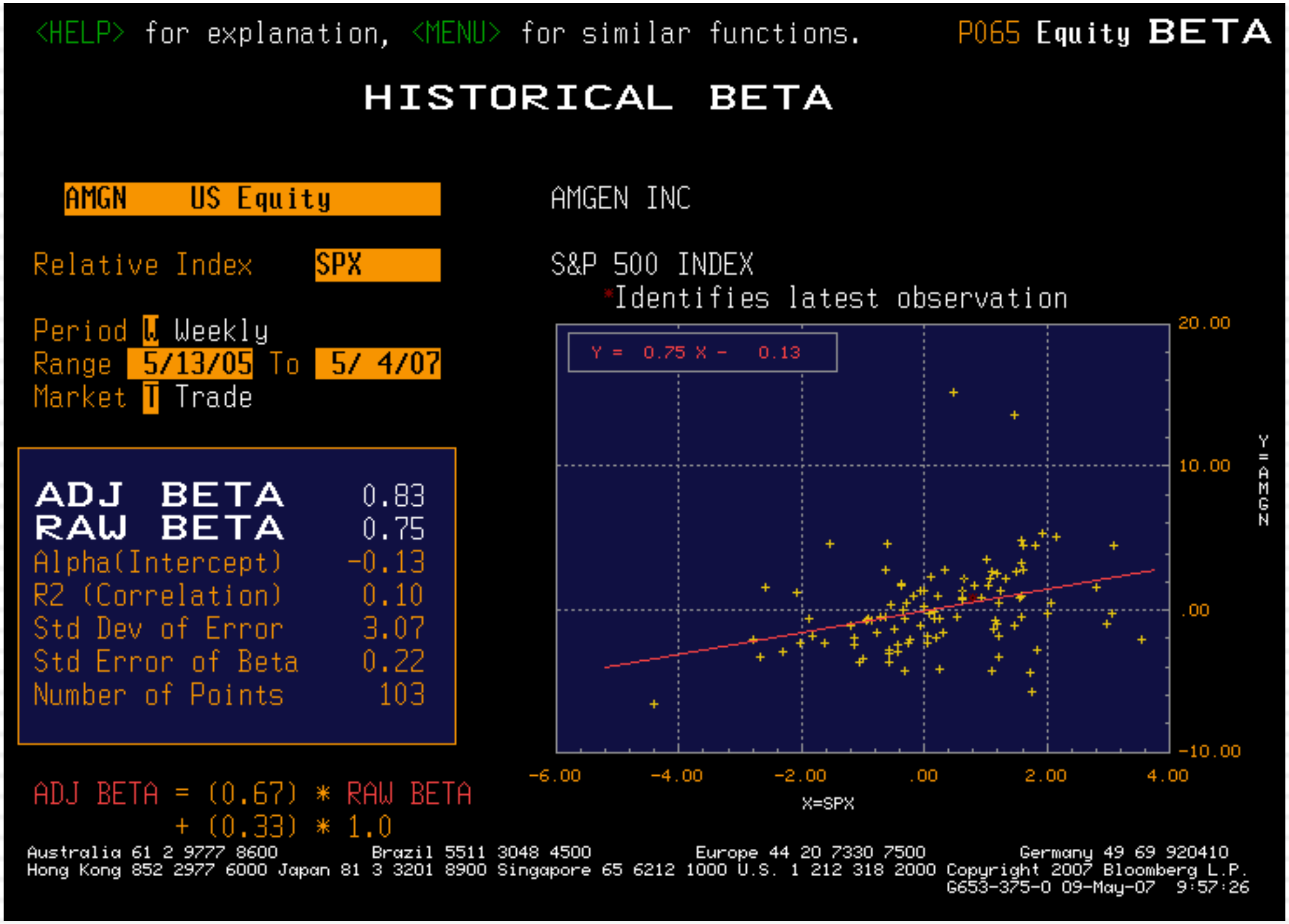
Risk Premium
8.11%

D/E = 89.04%

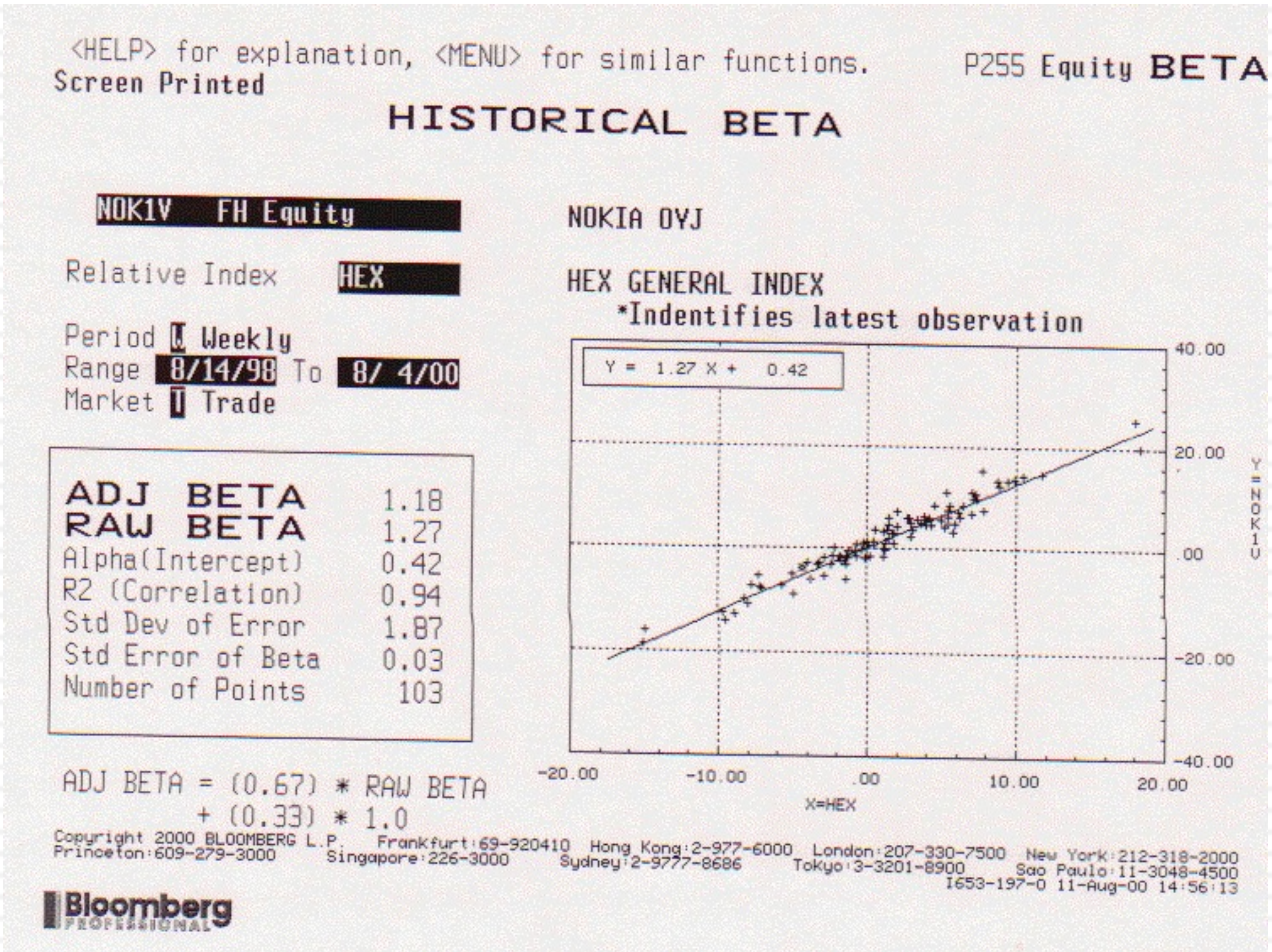
Business	*Revenues*	*EV/Sales*	*Estimated Value*	*Unlevered Beta*
Furn/Home Furnishings	$ 20,657	0.9785	$ 20,213	0.97
Electronics (Consumer & Office)	$ 2,807	0.5769	$ 1,619	1.30
Arcelik	$ 23,464		$ 21,833	0.99

Region	*Revenues*	*ERP*	*Weight*
Europe	13,272 ₺	6.68%	49.37%
Turkey	8,425 ₺	10.53%	31.34%
Asia	2,299 ₺	7.00%	8.55%
Africa & Mid East	1,926 ₺	9.08%	7.16%
Rest of the World	963 ₺	7.39%	3.58%
Total	26,885 ₺	8.11%	100.00%

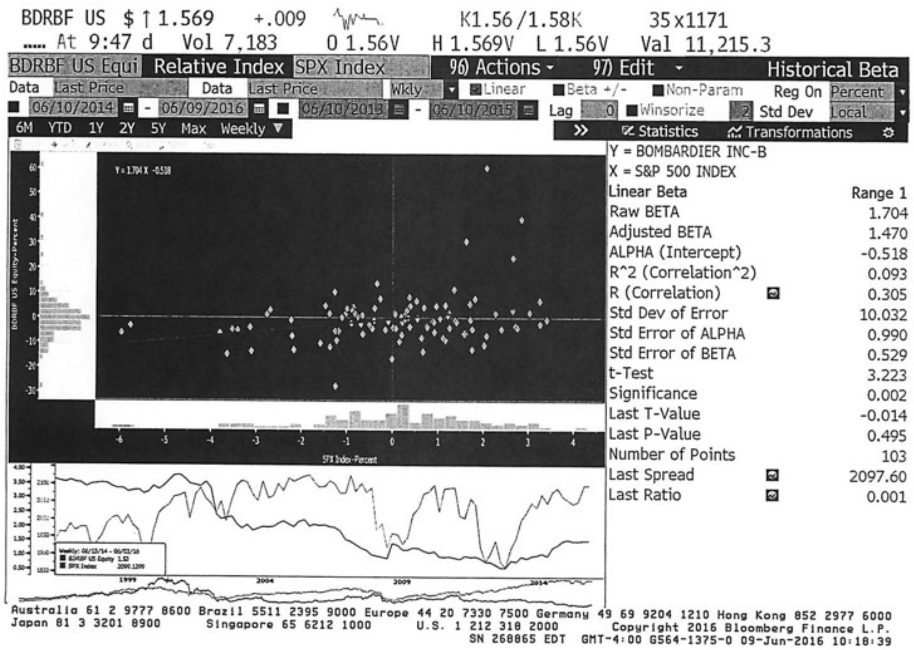
IV. Betas do not come from regressions… and are noisy…

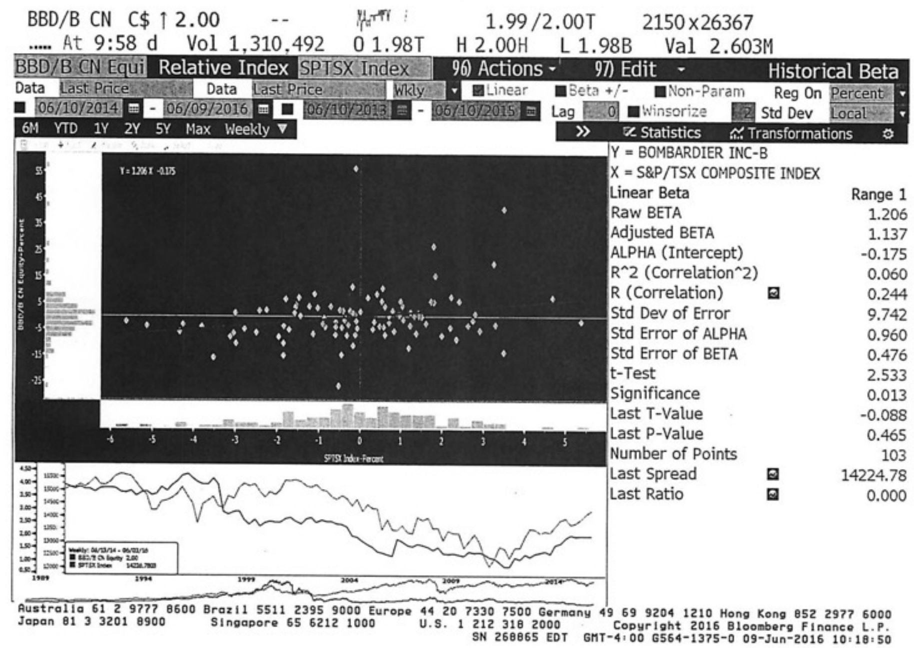


But should not be trusted, even when they look great…

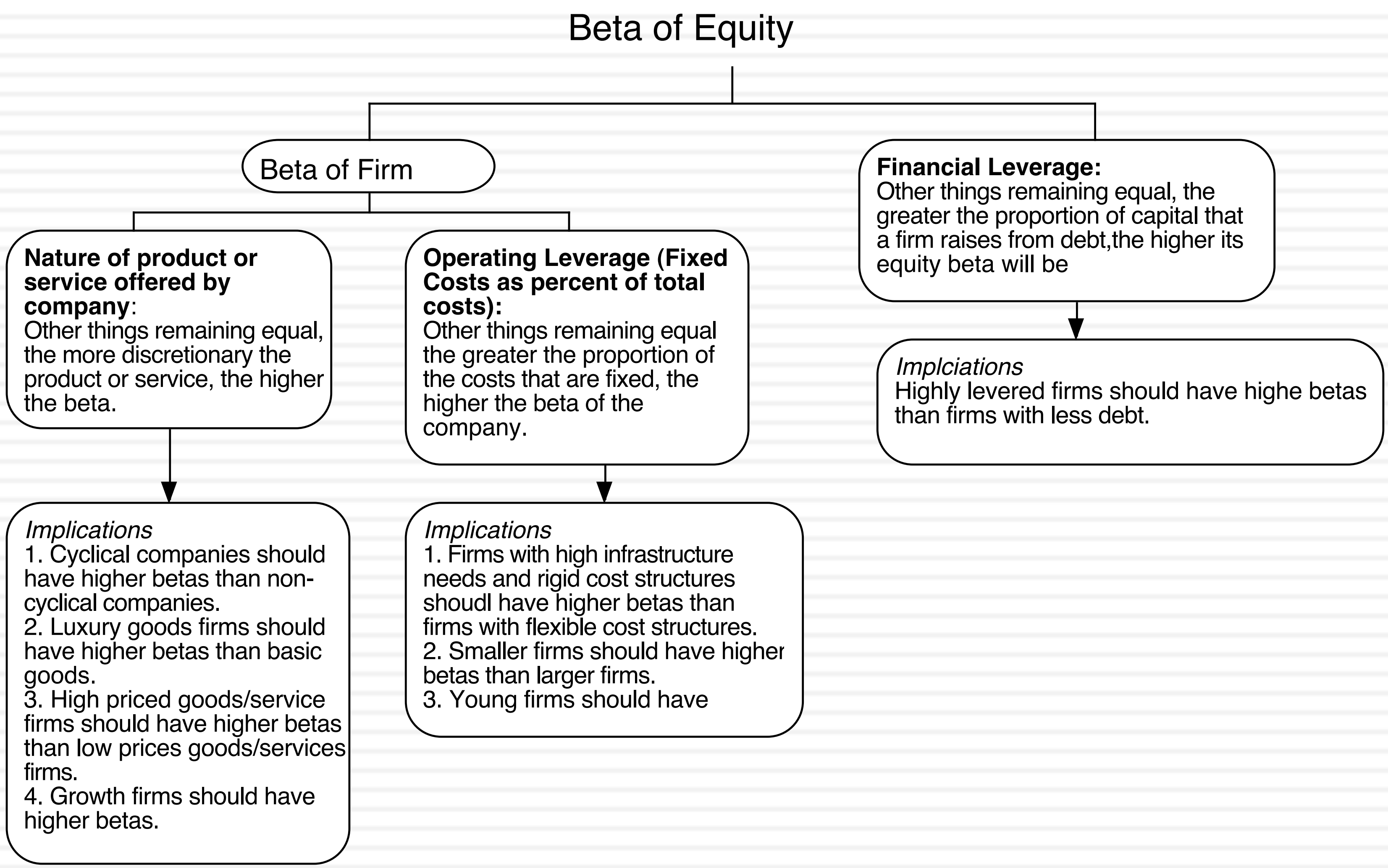


And subject to game playing





Determinants of Betas



Bottom-up Betas

Step 1: Find the business or businesses that your firm operates in.

Possible Refinements

Step 2: Find publicly traded firms in each of these businesses and obtain their regression betas. Compute the simple average across these regression betas to arrive at an average beta for these publicly traded firms. Unlever this average beta using the average debt to equity ratio across the publicly traded firms in the sample.
Unlevered beta for business = Average beta across publicly traded firms/ (1 + (1- t) (Average D/E ratio across firms))

If you can, adjust this beta for differences between your firm and the comparable firms on operating leverage and product characteristics.

Step 3: Estimate how much value your firm derives from each of the different businesses it is in.

While revenues or operating income are often used as weights, it is better to try to estimate the value of each business.

Step 4: Compute a weighted average of the unlevered betas of the different businesses (from step 2) using the weights from step 3.
Bottom-up Unlevered beta for your firm = Weighted average of the unlevered betas of the individual business

If you expect the business mix of your firm to change over time, you can change the weights on a year-to-year basis.

Step 5: Compute a levered beta (equity beta) for your firm, using the market debt to equity ratio for your firm.
Levered bottom-up beta = Unlevered beta (1+ (1-t) (Debt/Equity))

If you expect your debt to equity ratio to change over time, the levered beta will change over time.

Three examples…

- Amgen
  - The unlevered beta for pharmaceutical firms is 1.59. Using Amgen's debt to equity ratio of 11%, the bottom up beta for Amgen is
  - Bottom-up Beta = 1.59 (1+ (1-.35)(.11)) = 1.73
- Tata Motors
  - The unlevered beta for automobile firms is 0.98. Using Tata Motor's debt to equity ratio of 33.87%, the bottom up beta for Tata Motors is
  - Bottom-up Beta = 0.98 (1+ (1-.3399)(.3387)) = 1.20
- Fertiglobe
  - The unlevered beta of global fertilizer companies is 1.04. Using Fertiglobe's debt to equity ratio of 2.84% and a tax rate of 25%, the bottom up beta is
  - Bottom up Beta = 1.04 (1 + (1-.25) (.0284)) = 1.06
- Almarai

Business	Revenue Weight	Unlevered Beta
Packaged Food	81%	0.82
Agricultural Products	19%	0.58
Company		0.77

V. And the past is not always a good indicator of the future.

	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2021	8.49%	6.71%	6.69%	5.13%
Std Error	2.05%	2.17%		
1972-2021	8.04%	5.47%	6.70%	4.47%
Std Error	2.44%	2.76%		
2012-2021	16.47%	14.39%	15.89%	14.00%
Std Error	3.88%	4.59%		

- If you are going to use a historical risk premium, make it
  - Long term (because of the standard error)
  - Consistent with your risk free rate
  - A “compounded” average
- No matter which estimate you use, recognize that it is backward looking, is noisy and may reflect selection bias

But in the future..

In 2021, earnings recovered almost entirely from the 2020 collapse and dividends & buybacks surged as well.

Base year cash flow (last 12 mths)
Dividends (TTM): 59.20
+ Buybacks (TTM): 88.05
= Cash to investors (TTM): **147.24**

Expected earnings/cashflow growth in next 5 years
Analysts were on target in 2021, with estimated earnings of 206.38 for the year. They were projecting compunded annual growth rate of 6.47% a year for next five years.

Modified Payout
This computation assumes that the payout ratio stays constant over time. If you assume that it changes to a sustainable level (given stable growth & ROE), the implied ERP = 4.90%

Actual numbers

Forecasted numbers

	2019	2020	*LTM*	*2021E*	1	2	3	4	5
Expected Earnings	157.18	139.76	190.34	206.38	219.74	233.96	249.11	265.23	282.40
Cash payout as % of earnings	146.31	118.66	77.36%	77.36%	77.36%	77.36%	77.36%	77.36%	77.36%
Dividends + Buybacks =	93.08%	84.90%	147.24	159.65	$169.99	$180.99	$192.71	$205.18	$218.46

Earnings and Cash flows grow @1.51% (set equal to risk free rate) a year forever.

S&P 500 on 1/1/22= **4766.18**

$$4766.18 = \frac{169.99}{(1+r)} + \frac{180.99}{(1+r)^2} + \frac{192.71}{(1+r)^3} + \frac{205.18}{(1+r)^4} + \frac{218.46}{(1+r)^5} + \frac{218.46\ (1.0151)}{(r-.0151)(1+r)^5}$$

The last term in this equation is the expected index level at the end of year 5 (capturing price appreciation)

Solve for r

You can solve for this r either iteratively or using the solver function in Excel

r = Implied Expected Return on Stocks = 5.75%

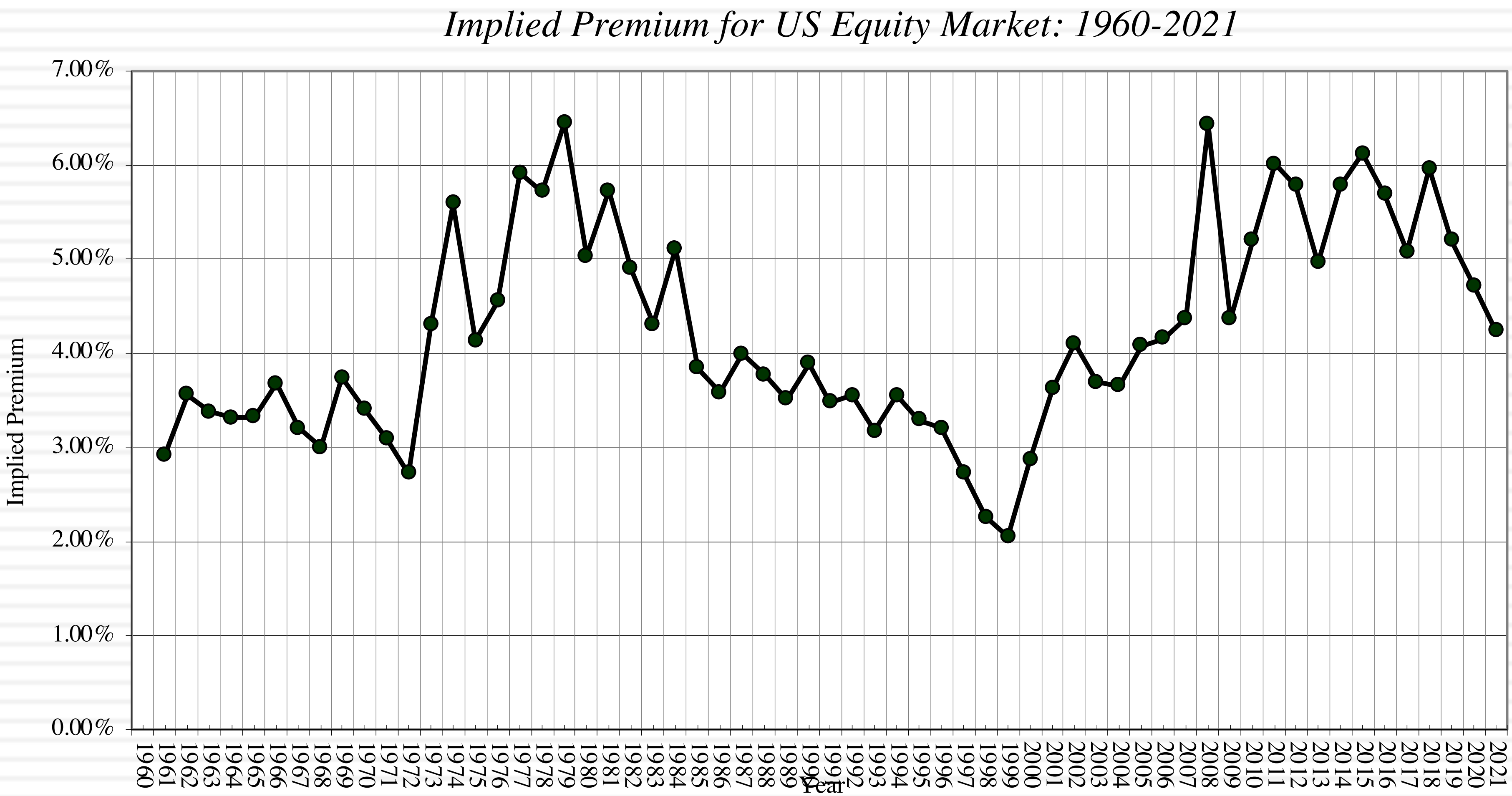
Minus

Risk free rate = T.Bond rate on 1/1/22= 1.51%

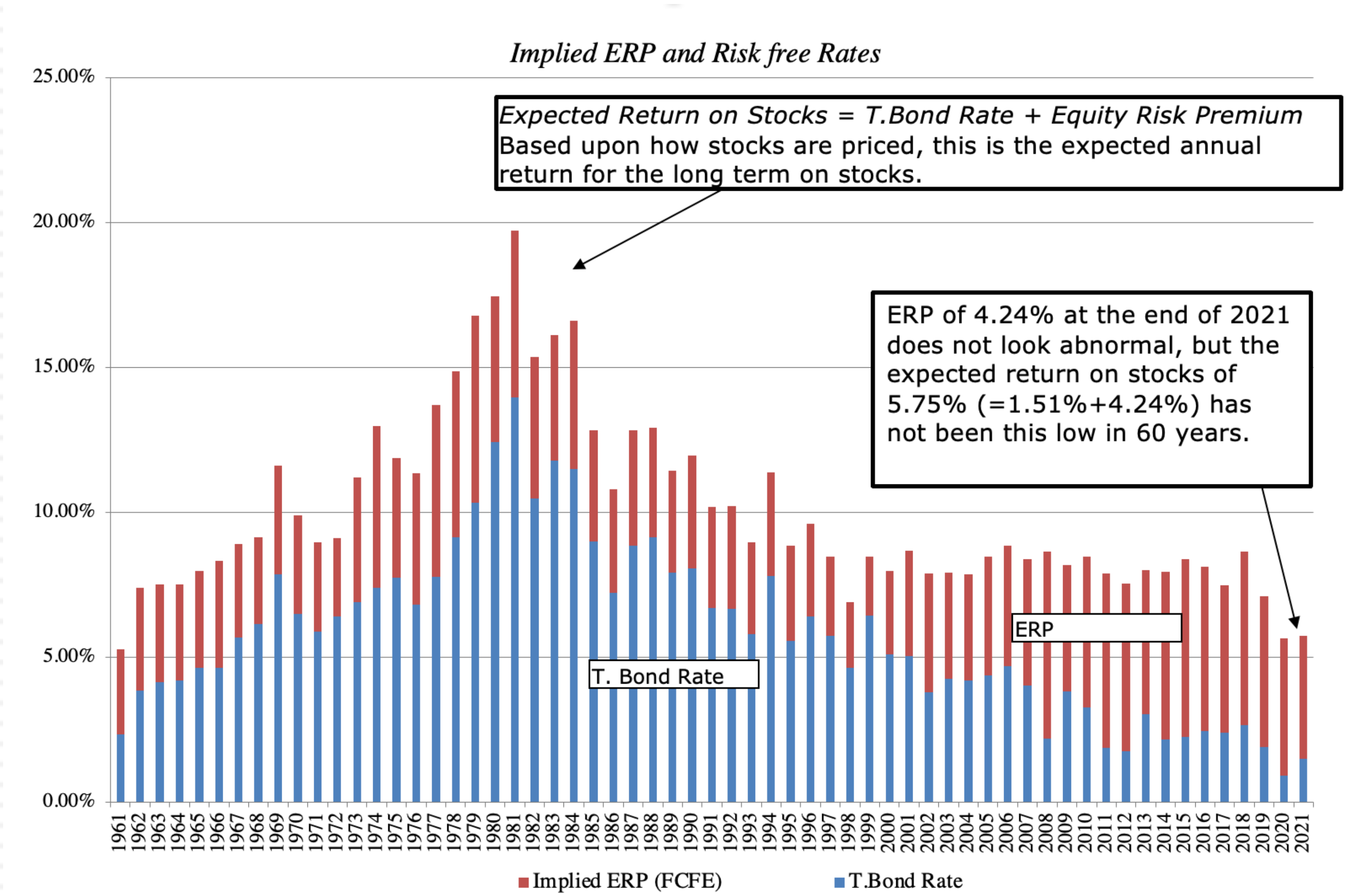
Equals

Implied Equity Risk Premium (1/1/22) = 5.75% - 1.51% = 4.24%

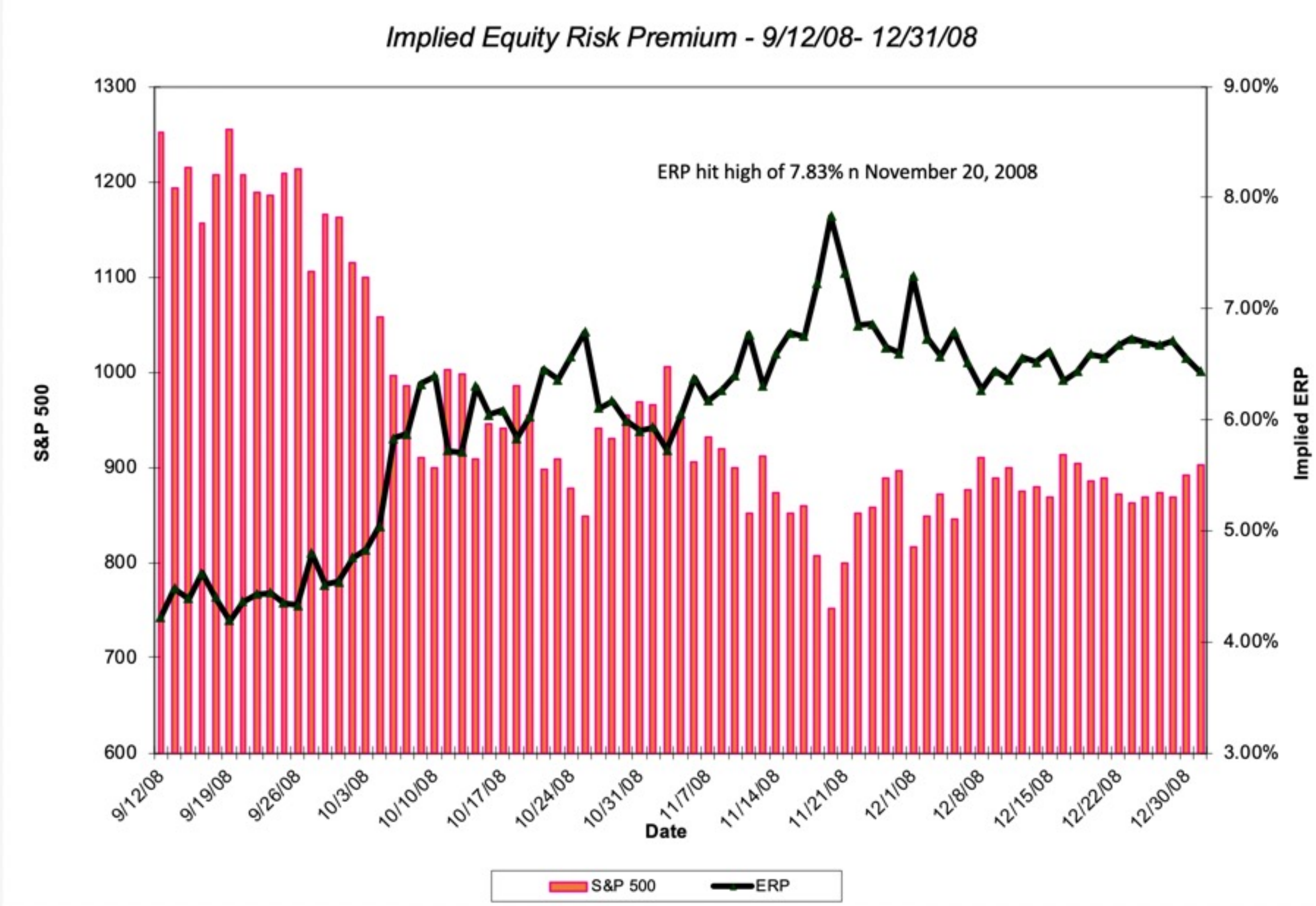
Implied ERP for the S&P 500: History



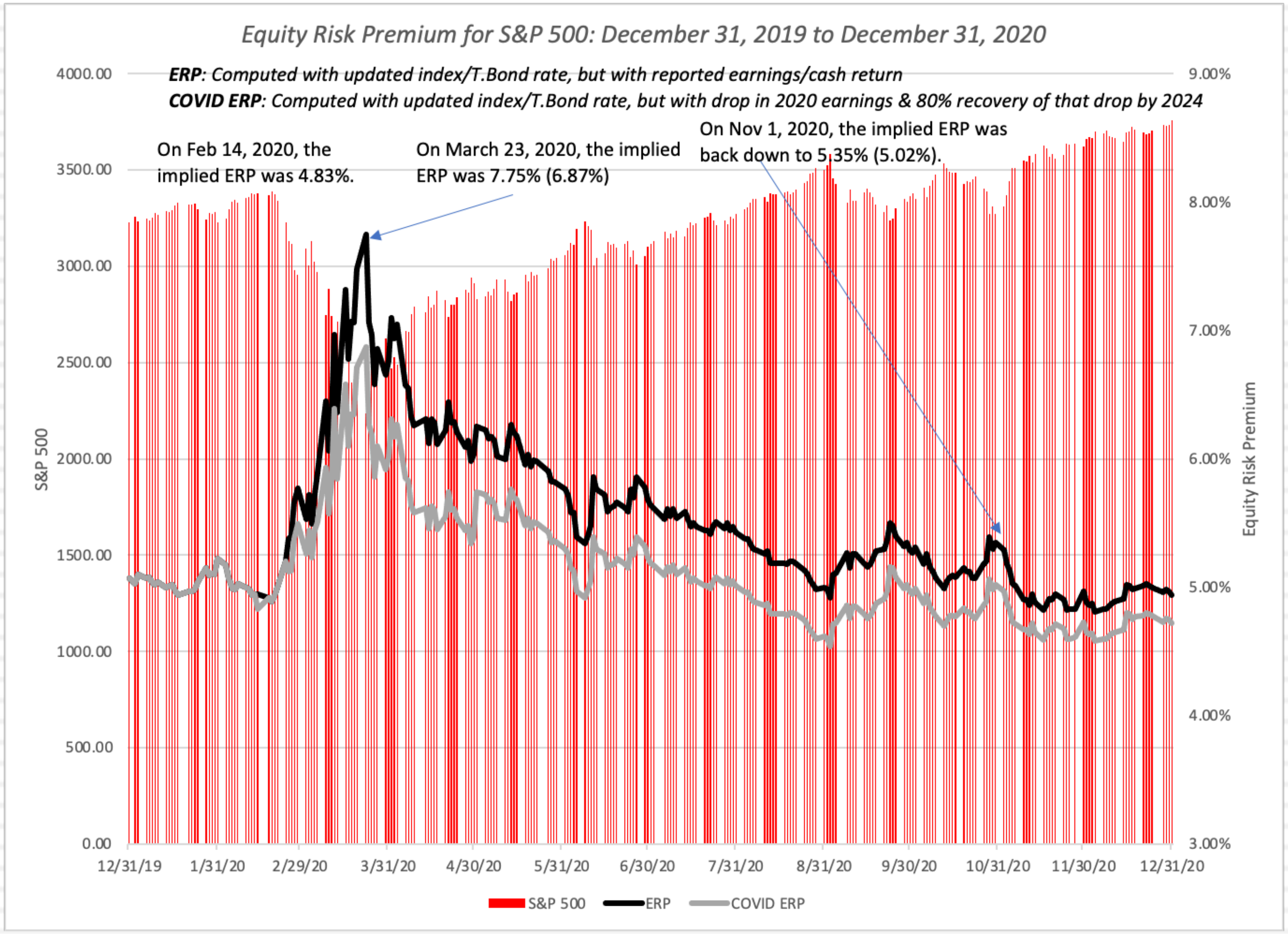
Another Perspective on US stocks



The Price of Risk: The 2008 Crisis



The Price of Risk: The COVID crisis



Implied Premium for India using the Sensex: April 2010

- Level of the Index = 17559
- FCFE on the Index = 3.5% (Estimated FCFE for companies in index as % of market value of equity)
- Other parameters
  - Riskfree Rate = 5% (Rupee)
  - Expected Growth (in Rupee)
    - Next 5 years = 20% (Used expected growth rate in Earnings)
    - After year 5 = 5%
- Solving for the expected return:
  - Expected return on Equity = 11.72%
  - Implied Equity premium for India =11.72% - 5% = 6.72%

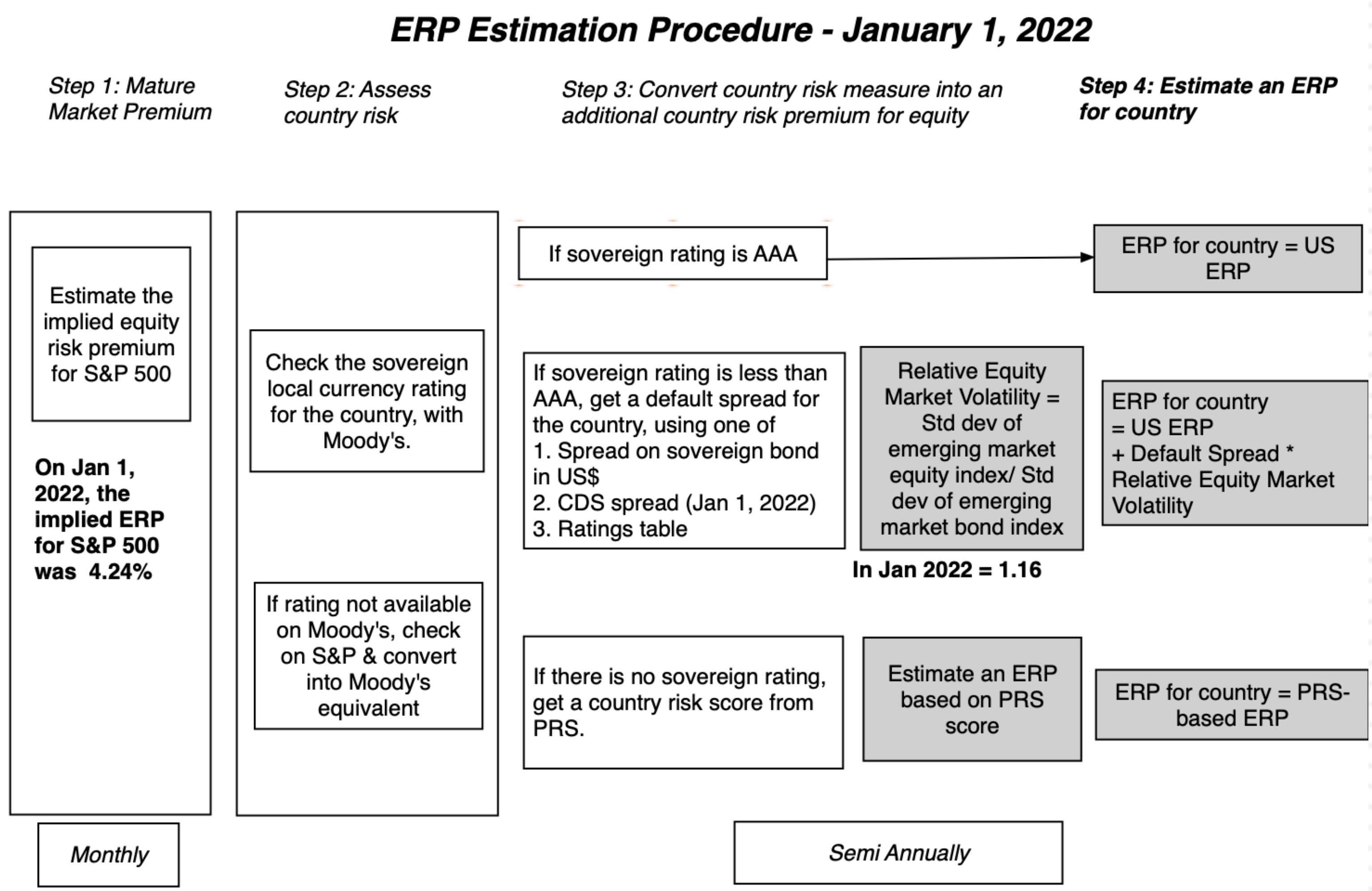
Global Equities?

Start of year	*PBV (Developed)*	*PBV (Emerging)*	*ROE (Developed)*	*ROE (Emerging)*	*US T.Bond Rate*	*Growth Rate (Developed)*	*Growth Rate (Emerging)*	*Cost of Equity (Developed)*	*Cost of Equity (Emerging)*	*Differential*
2004	2.00	1.19	10.81%	11.65%	4.25%	3.75%	4.75%	7.28%	10.55%	3.27%
2005	2.09	1.27	11.12%	11.93%	4.22%	3.72%	4.72%	7.26%	10.40%	3.14%
2006	2.03	1.44	11.32%	12.18%	4.39%	3.89%	4.89%	7.55%	9.95%	2.40%
2007	1.67	1.67	10.87%	12.88%	4.70%	4.20%	5.20%	8.19%	9.80%	1.60%
2008	0.87	0.83	9.42%	11.12%	4.02%	3.52%	4.52%	10.30%	12.47%	2.17%
2009	1.20	1.34	8.48%	11.02%	2.21%	1.71%	2.71%	7.35%	8.91%	1.56%
2010	1.39	1.43	9.14%	11.22%	3.84%	3.34%	4.34%	7.51%	9.15%	1.64%
2011	1.12	1.08	9.21%	10.04%	3.29%	2.79%	3.79%	8.52%	9.58%	1.05%
2012	1.17	1.18	9.10%	9.33%	1.88%	1.38%	2.38%	7.98%	8.27%	0.29%
2013	1.56	1.63	8.67%	10.48%	1.76%	1.26%	2.26%	6.01%	7.30%	1.29%
2014	1.95	1.50	9.27%	9.64%	3.04%	2.54%	3.54%	5.99%	7.61%	1.62%
2015	1.88	1.56	9.69%	9.75%	2.17%	1.67%	2.67%	5.94%	7.21%	1.27%
2016	1.99	1.59	9.24%	10.16%	2.27%	1.77%	2.77%	5.52%	7.42%	1.89%
2017	1.76	1.48	8.71%	9.53%	2.68%	2.18%	3.18%	5.89%	7.47%	1.58%
2018	1.98	1.66	11.23%	11.36%	2.68%	2.18%	3.18%	6.75%	8.11%	1.36%
2019	1.64	1.31	12.09%	11.35%	2.68%	2.18%	3.18%	8.22%	9.42%	1.19%

VI. There is a downside to globalization…

- Emerging markets offer growth opportunities but they are also riskier. If we want to count the growth, we have to also consider the risk.
- Two ways of estimating the country risk premium:
  - Sovereign Default Spread: In this approach, the country equity risk premium is set equal to the default spread of the bond issued by the country.
    - Equity Risk Premium for mature market = 6.00%
    - Default Spread for India = 200% (based on rating)
    - Equity Risk Premium for India = 6.00% + 2.00% = 8.00%
  - Adjusted for equity risk: The country equity risk premium is based upon the volatility of the equity market relative to the government bond rate.
    - Country risk premium= Default Spread* Std $\text{Deviation}_{\text{Country Equity}}$ / Std $\text{Deviation}_{\text{Country Bond}}$
    - Standard Deviation in Sensex = 21%
    - Standard Deviation in Indian government bond= 14%
    - Default spread on Indian Bond= 2%
    - Additional country risk premium for India = 2% (21/14) = 3.00%
    - Total equity risk premium = US equity risk premium + CRP for India
      = 6.00% + 3.00% = 9.00%

A Template for Estimating the ERP



ERP : July 2022

Andorra (Principality of)	Baa2	2.66%	8.67%	Italy	Baa3	3.07%	9.08%
Austria	Aa1	0.56%	6.57%	Jersey (States of)	Aaa	0.00%	6.01%
Belgium	Aa3	0.84%	6.85%	Liechtenstein	Aaa	0.00%	6.01%
Cyprus	Ba1	3.50%	9.51%	Luxembourg	Aaa	0.00%	6.01%
Denmark	Aaa	0.00%	6.01%	Malta	A2	1.18%	7.19%
Finland	Aa1	0.56%	6.57%	Netherlands	Aaa	0.00%	6.01%
France	Aa2	0.69%	6.70%	Norway	Aaa	0.00%	6.01%
Germany	Aaa	0.00%	6.01%	Portugal	Baa2	2.66%	8.67%
Greece	Ba3	5.03%	11.04%	Spain	Baa1	2.23%	8.24%
Guernsey (States of)	Aaa	0.00%	6.01%	Sweden	Aaa	0.00%	6.01%
Iceland	A2	1.18%	7.19%	Switzerland	Aaa	0.00%	6.01%
Ireland	A1	0.99%	7.00%	Turkey	B2	7.69%	13.70%
Isle of Man	Aa3	0.84%	6.85%	United Kingdom	Aa3	0.84%	6.85%
				Western Europe		**1.16%**	**7.17%**

Canada	Aaa	0.00%	6.01%
United States	Aaa	0.00%	6.01%
US & Canada		**0.00%**	**6.01%**

Caribbean		**9.06%**	**15.07%**

Argentina	Ca	16.78%	22.79%
Belize	Caa3	13.98%	19.99%
Bolivia	B2	7.69%	13.70%
Brazil	Ba2	4.21%	10.22%
Chile	A1	0.99%	7.00%
Colombia	Baa2	2.66%	8.67%
Costa Rica	B2	7.69%	13.70%
Ecuador	Caa3	13.98%	19.99%
El Salvador	Caa3	13.98%	19.99%
Guatemala	Ba1	3.50%	9.51%
Honduras	B1	6.29%	12.30%
Mexico	Baa1	2.23%	8.24%
Nicaragua	B3	9.09%	15.10%
Panama	Baa2	2.66%	8.67%
Paraguay	Ba1	3.50%	9.51%
Peru	Baa1	2.23%	8.24%
Suriname	Caa3	13.98%	19.99%
Uruguay	Baa2	2.66%	8.67%
Venezuela	C	20.40%	26.41%
Latin America		**5.20%**	**11.21%**

Country	Rating	*CRP*	*ERP*
Angola	B3	9.09%	15.10%
Benin	B1	6.29%	12.30%
Botswana	A3	1.68%	7.69%
Burkina Faso	Caa1	10.48%	16.49%
Cameroon	B2	7.69%	13.70%
Cape Verde	B3	9.09%	15.10%
Congo (Democratic Republic of)	Caa1	10.48%	16.49%
Congo (Republic of)	Caa2	12.59%	18.60%
Côte d'Ivoire	Ba3	5.03%	11.04%
Egypt	B2	7.69%	13.70%
Ethiopia	Caa2	12.59%	18.60%
Gabon	Caa1	10.48%	16.49%
Ghana	Caa1	10.48%	16.49%
Kenya	B2	7.69%	13.70%
Mali	Caa2	12.59%	18.60%
Mauritius	Baa2	2.66%	8.67%
Morocco	Ba1	3.50%	9.51%
Mozambique	Caa2	12.59%	18.60%
Namibia	B1	6.29%	12.30%
Niger	B3	9.09%	15.10%
Nigeria	B2	7.69%	13.70%
Rwanda	B2	7.69%	13.70%
Senegal	Ba3	5.03%	11.04%
South Africa	Ba2	4.21%	10.22%
Swaziland	B3	9.09%	15.10%
Tanzania	B2	7.69%	13.70%
Togo	B3	9.09%	15.10%
Tunisia	Caa1	10.48%	16.49%
Uganda	B2	7.69%	13.70%
Zambia	Ca	16.78%	22.79%
Africa		7.36%	13.37%

Albania	B1	6.29%	12.30%
Armenia	Ba3	5.03%	11.04%
Azerbaijan	Ba2	4.21%	10.22%
Belarus	Ca	16.78%	22.79%
Bosnia and Herz	B3	9.09%	15.10%
Bulgaria	Baa1	2.23%	8.24%
Croatia	Ba1	3.50%	9.51%
Czech Republic	Aa3	0.84%	6.85%
Estonia	A1	0.99%	7.00%
Georgia	Ba2	4.21%	10.22%
Hungary	Baa2	2.66%	8.67%
Kazakhstan	Baa2	2.66%	8.67%
Kyrgyzstan	B3	9.09%	15.10%
Latvia	A3	1.68%	7.69%
Lithuania	A2	1.18%	7.19%
Macedonia	Ba3	5.03%	11.04%
Moldova	B3	9.09%	15.10%
Montenegro	B1	6.29%	12.30%
Poland	A2	1.18%	7.19%
Romania	Baa3	3.07%	9.08%
Russia	Ca	16.78%	22.79%
Serbia	Ba2	4.21%	10.22%
Slovakia	A2	1.18%	7.19%
Slovenia	A3	1.68%	7.69%
Tajikistan	B3	9.09%	15.10%
Ukraine	Caa3	13.98%	19.99%
Uzbekistan	B1	6.29%	12.30%
E. Europe & Russia		8.85%	**14.86%**

Abu Dhabi	Aa2	0.69%	6.70%
Bahrain	B2	7.69%	13.70%
Iraq	Caa1	10.48%	16.49%
Israel	A1	0.99%	7.00%
Jordan	B1	6.29%	12.30%
Kuwait	A1	0.99%	7.00%
Lebanon	C	20.40%	26.41%
Oman	Ba3	5.03%	11.04%
Qatar	Aa3	0.84%	6.85%
Ras Al Khaimah	A1	0.99%	7.00%
Saudi Arabia	A1	0.99%	7.00%
Sharjah	Baa3	3.07%	9.08%
United Arab Em	Aa2	0.69%	6.70%
Middle East		**2.02%**	**8.03%**

Country	*PRS*	*CRP*	*ERP*
Algeria	66.75	6.29%	12.30%
Brunei	79.25	1.18%	7.19%
Gambia	66.25	6.29%	12.30%
Guinea	58	12.59%	18.60%
Guinea-Bissau	63.5	9.09%	15.10%
Guyana	75.75	2.23%	8.24%
Haiti	56	13.98%	19.99%
Iran	66.25	6.29%	12.30%
Korea, D.P.R.	51.25	16.78%	22.79%
Liberia	58.25	12.59%	18.60%
Libya	71	4.21%	10.22%
Madagascar	63.25	9.09%	15.10%
Malawi	56.75	13.98%	19.99%
Myanmar	57.75	12.59%	18.60%
Sierra Leone	54.75	16.78%	22.79%
Somalia	52	16.78%	22.79%
Sudan	47	20.40%	26.41%
Syria	45.25	20.40%	26.41%
Yemen, Republic	48.25	20.40%	26.41%
Zimbabwe	60.75	10.48%	16.49%

Bangladesh	Ba3	5.03%	11.04%
Cambodia	B2	7.69%	13.70%
China	A1	0.99%	7.00%
Fiji	B1	6.29%	12.30%
Hong Kong	Aa3	0.84%	6.85%
India	Baa3	3.07%	9.08%
Indonesia	Baa2	2.66%	8.67%
Japan	A1	0.99%	7.00%
Korea	Aa2	0.69%	6.70%
Laos	Caa3	13.98%	19.99%
Macao	Aa3	0.84%	6.85%
Malaysia	A3	1.68%	7.69%
Maldives	Caa1	10.48%	16.49%
Mongolia	B3	9.09%	15.10%
Pakistan	B3	9.09%	15.10%
Papua New Guinea	B2	7.69%	13.70%
Philippines	Baa2	2.66%	8.67%
Singapore	Aaa	0.00%	6.01%
Solomon Islands	Caa1	10.48%	16.49%
Sri Lanka	Ca	16.78%	22.79%
Taiwan	Aa3	0.84%	6.85%
Thailand	Baa1	2.23%	8.24%
Vietnam	Ba3	5.03%	11.04%
Asia		1.56%	7.57%

Australia	Aaa	0.00%	6.01%
Cook Islands	Caa1	10.48%	16.49%
New Zealand	Aaa	0.00%	6.01%
Australia & NZ		0.00%	**6.01%**

Blue: Moody's Rating
Red: Added Country Risk
Green #: Total ERP

Aswath Damodaran

VII. And it is not just emerging market companies that are exposed to this risk..

- The “default” approach in valuation has been to assign country risk based upon your country of incorporation. Thus, if you are incorporated in a developed market, the assumption has been that you are not exposed to emerging market risks. If you are incorporated in an emerging market, you are saddled with the entire country risk.
- As companies globalize and look for revenues in foreign markets, this practice will under estimate the costs of equity of developed market companies with significant emerging market risk exposure and over estimate the costs of equity of emerging market companies with significant developed market risk exposure.

Fertiglobe: Equity Risk Premium in 2022

Region	*Revenues*	*ERP*	*Weight*
Africa	$294	13.37%	8.88%
Asia & Oceania	$1,177	7.57%	35.55%
Central and South America	$476	11.21%	14.38%
Middle East	$61	8.03%	1.84%
North America	$356	6.01%	10.75%
Western Europe	$947	7.17%	28.60%
Total	**$3,311**	**8.33%**	**100.00%**

Natural Resource Twists? Royal Dutch

Country	*Oil & Gas Production*	*% of Total*	*ERP*
Denmark	17396	3.83%	6.20%
Italy	11179	2.46%	9.14%
Norway	14337	3.16%	6.20%
UK	20762	4.57%	6.81%
Rest of Europe	*874*	*0.19%*	*7.40%*
Brunei	823	0.18%	9.04%
Iraq	20009	4.40%	11.37%
Malaysia	22980	5.06%	8.05%
Oman	78404	17.26%	7.29%
Russia	22016	4.85%	10.06%
Rest of Asia & ME	*24480*	*5.39%*	*7.74%*
Oceania	*7858*	*1.73%*	*6.20%*
Gabon	12472	2.75%	11.76%
Nigeria	67832	14.93%	11.76%
Rest of Africa	6159	1.36%	12.17%
USA	104263	22.95%	6.20%
Canada	8599	1.89%	6.20%
Brazil	13307	2.93%	9.60%
Rest of Latin America	*576*	*0.13%*	*10.78%*
Royal Dutch Shell	**454326**	**100.00%**	**8.26%**

An alternate way: Estimating a company's exposure to country risk (Lambda)

- **Just as beta measures exposure to macro economic risk, lambda measures exposure just to country risk. Like beta, it is scaled around one.**
- The easiest and most accessible data is on revenues. Most companies break their revenues down by region. One simplistic solution would be to do the following:

  $$\text{Lambda} = \%\text{ of revenues domestically}_{\text{firm}} / \%\text{ of revenues domestically}_{\text{average firm}}$$

- In 2008-09, Tata Motors got about 91.37% of its revenues in India and TCS got 7.62%. The average Indian firm gets about 80% of its revenues in India:
  - $\text{Lambda}_{\text{Tata Motors}} = 91\%/80\% = 1.14$
  - The danger of focusing just on revenues is that it misses other exposures to risk (production and operations).

	Tata Motors	*TCS*
% of production/operations in India	High	High
% of revenues in India	91.37% (in 2009) Estimated 70% (in 2010)	7.62%
Lambda	0.80	0.20
Flexibility in moving operations	Low. Significant physical assets.	High. Human capital is mobile.

VIII. Growth has to be earned (not endowed or estimated): Sustainable Growth

Expected Growth

- Net Income
  - *Retention Ratio=* 1 - Dividends/Net Income
  - X
  - *Return on Equity* Net Income/Book Value of Equity
- Operating Income
  - *Reinvestment Rate =* (Net Cap Ex + Chg in WC/EBIT(1-t)
  - X
  - *Return on Capital =* EBIT(1-t)/Book Value of Capital

1. <u>No free growth</u>: In the long term, to grow, you have to reinvest.
2. <u>Growth Quality</u>: For a given reinvestment, the higher the return you generate on your reinvestment, the faster you can grow.
3. <u>Scaling up is hard to do:</u> As companies get larger, it gets more difficult to sustain value-adding growth.

Measuring Returns: The Quandary

Abnormal earnings
Last 12 months might have been unusally good or bad

Accounting Issues
Operating income can be skewed by accounting misclassification (leases and R&D) and by unusual expenses/income.

Computed as operating income in most recent 12 months, net of the effective tax rate paid during those 12 months

Life Cycle Effect
Current earnings are not indicative of long term earnings potential for young & infrastructure firms

Return on Invested Capital = After-tax Operating Income / Capital Invested in existing assets

This is your proxy for returns made on existing assets and for continuing returns from those assets

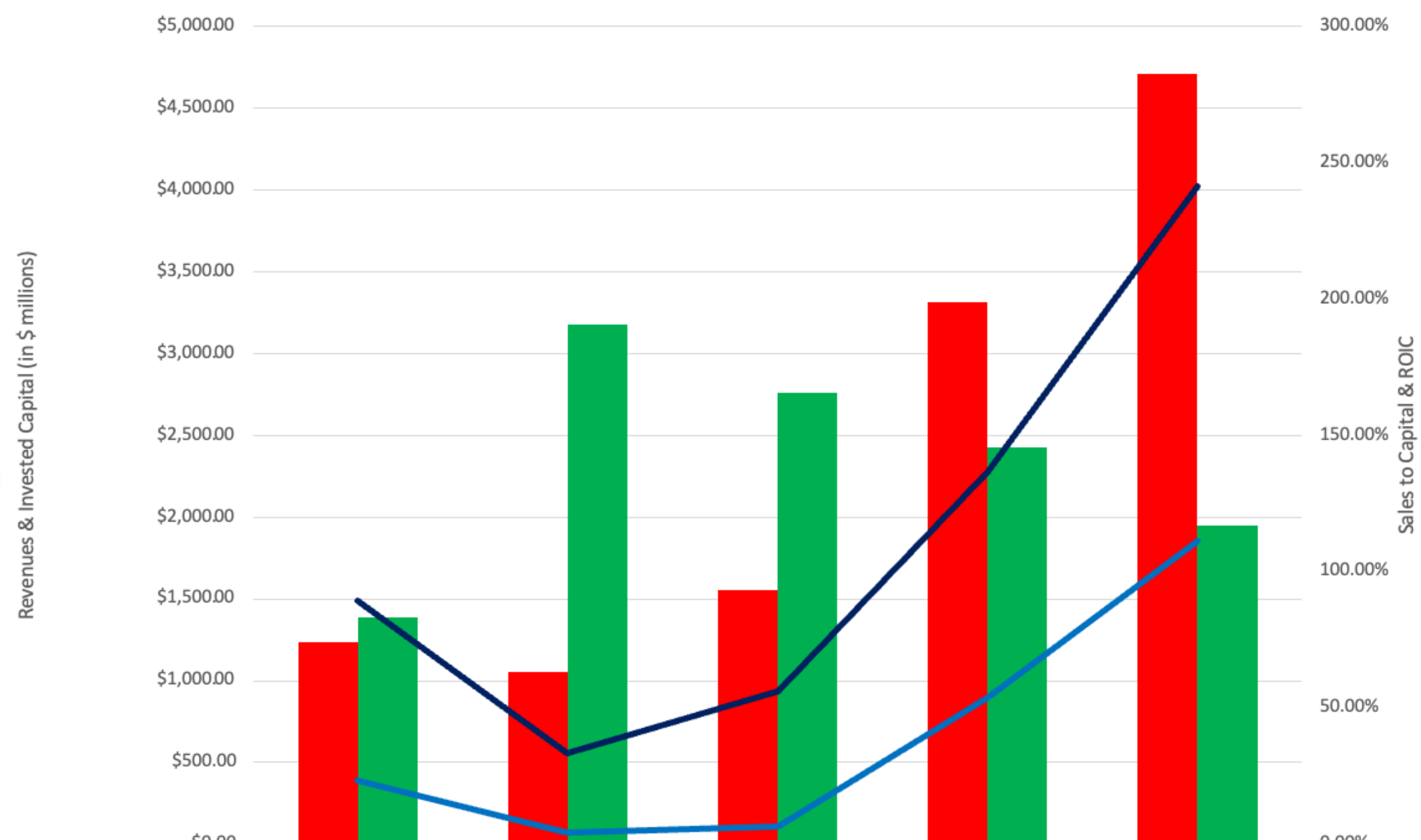
Accounting Write offs
Writing off mistakes can reduce invested capital & make it look better than it should.

Invested Capital = Book value of equity + Book value of debt - Cash & Cross holdings

Inflation
If asset book value is not adjusted for inflation, capital invested in older assets will be understated.

Accounting misclassification
When capital expenses (R&D) and financial expenses (leases) are miscategorized as operating expenses, invested capital will be understated.

Reinvestment & Return on Capital – Fertiglobe History



	2018	2019	2020	2021	2022
Revenues	$1,237.50	$1,055.50	$1,550.80	$3,310.70	$4,706.80
Invested Capital	1,385.1	3,177.1	2,763.8	2,424.0	1,949.3
ROIC	23.25%	4.48%	6.57%	53.82%	111.45%
Sales/Invested Capital	0.89	0.33	0.56	1.37	2.41

Earn at least your cost of capital! But companies seem to have trouble in practice

Sub Group	Number of firms	*Return on Capital - Cost of Capital*					Positive	Negative
		<-5%	-5% to -2%	-2% to +2%	2% to 5%	>5%		
Africa and Middle East	1,913	37.95%	14.69%	14.22%	7.16%	25.98%	39.52%	60.48%
Australia & NZ	1,510	60.66%	5.23%	7.48%	4.37%	22.25%	30.66%	69.34%
Canada	2,071	72.33%	4.01%	6.13%	2.95%	14.58%	21.05%	78.95%
China	6,377	27.16%	14.08%	13.88%	8.95%	35.93%	51.73%	48.27%
Eastern Europe & Russia	415	30.60%	12.77%	16.14%	9.88%	30.60%	47.95%	52.05%
EU & Environs	4,698	34.36%	11.56%	12.71%	6.85%	34.53%	47.40%	52.60%
India	3,526	33.35%	17.81%	12.62%	7.71%	28.50%	41.97%	58.03%
Japan	3,665	17.49%	16.13%	22.05%	10.89%	33.45%	53.70%	46.30%
Latin America & Caribbean	847	31.17%	11.57%	13.70%	8.50%	35.06%	49.23%	50.77%
Small Asia	8,346	35.85%	15.96%	15.37%	8.24%	24.57%	39.91%	60.09%
UK	1,037	37.51%	9.35%	10.22%	5.01%	37.90%	48.60%	51.40%
United States	4,593	39.95%	16.20%	6.88%	5.60%	31.37%	40.15%	59.85%
Global	38,998	35.67%	13.92%	13.17%	7.53%	29.71%	43.40%	56.60%

A More General Way to Estimate Growth: Top Down Growth

- All of the fundamental growth equations assume that the firm has a return on equity or return on capital it can sustain in the long term.
- When operating income is negative or margins are expected to change over time, we use a three step process to estimate growth:
  - Estimate growth rates in revenues over time
    - Determine the total market (given your business model) and estimate the market share that you think your company will earn.
    - Decrease the growth rate as the firm becomes larger
    - Keep track of absolute revenues to make sure that the growth is feasible
  - Estimate expected operating margins each year
    - Set a target margin that the firm will move towards
    - Adjust the current margin towards the target margin
  - Estimate the capital that needs to be invested to generate revenue growth and expected margins
    - Estimate a sales to capital ratio that you will use to generate reinvestment needs each year.

IX. All good things come to an end..And the terminal value is not an ATM…

This tax rate locks in forever. Does it make sense to use an effective tax rate?

Are you reinvesting enough to sustain your stable growth rate?
Reinv Rate = g/ ROC
Is the ROC that of a stable company?

$$\text{Terminal Value}_n = \frac{\text{EBIT}_{n+1}\ (1 - \text{tax rate})\ (1 - \text{Reinvestment Rate})}{\text{Cost of capital - Expected growth rate}}$$

This is a mature company. It's cost of capital should reflect that.

This growth rate should be less than the nomlnal growth rate of the economy

Myth 5.1: The only way to estimate terminal value is to use the perpetual growth model.	Myth 5.2: The perpetual growth model can give you an infinite value.	Myth 5.3: The growth rate is your biggest driver of terminal value.	Myth 5.4: Your growth rate cannot be negtive in a perpetual growth model.	Myth 5.5: If your terminal value is a high proportion of your DCF value, it is flawed.

$$\textit{Value of an asset with life} > n\ \textit{years} = \frac{E(CF_1)}{(1+r)^1} + \frac{E(CF_2)}{(1+r)^2} + .. + \frac{E(CF_n)}{(1+r)^n} + \frac{\textit{Terminal Value}_n}{(1+r)^n}$$

Truth 5.1: The terminal value can be based on annuities or a liquidation value.	Truth 5.2: Not if growth forever is capped at the growth rate of the economy.	Truth 5.3: Growth is not free & increasing growth can add or destory value.	Truth 5.4: Growth can be negative forever & is often more reflective of reality.	Truth 5.5: The terminal value should be a high percent of value today.

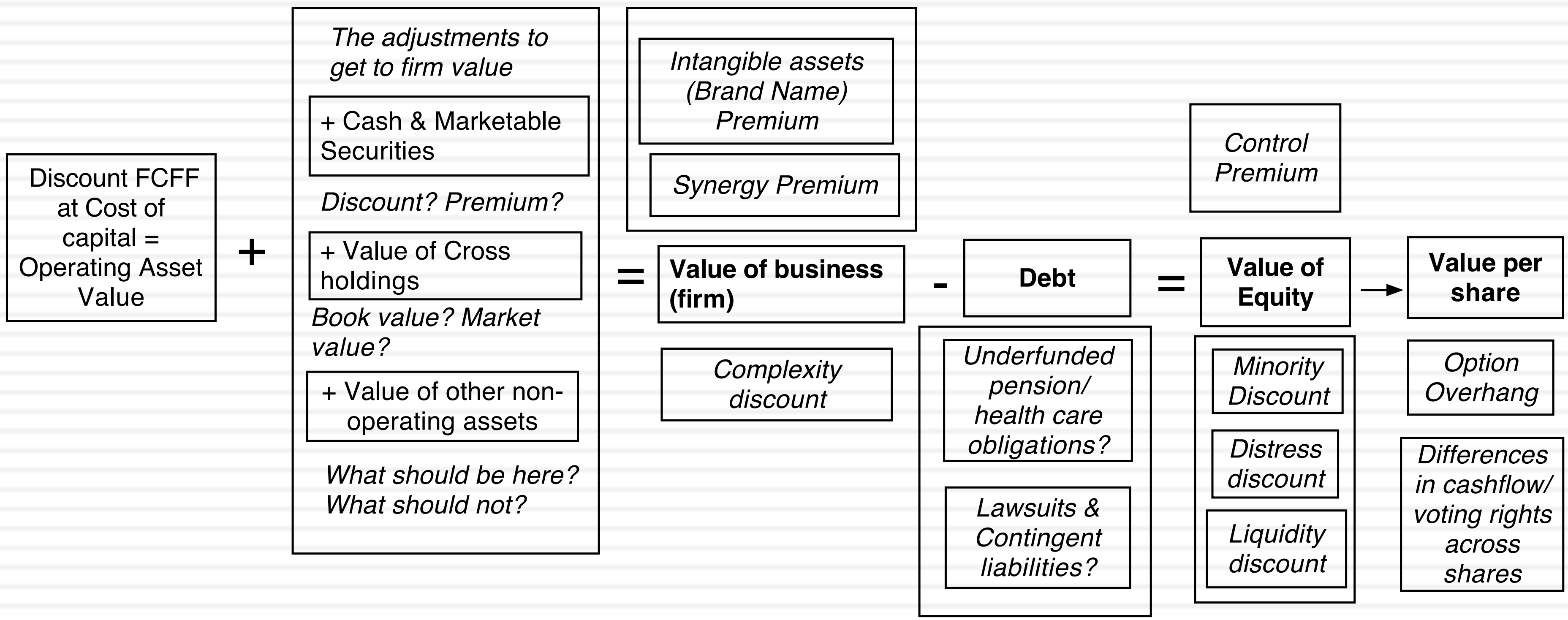
Terminal Value and Growth

Stable Growth Rate	*Amgen*	*Tata Motors*	*Fertiglobe*	*Heineken*
0%	$150,652	₹ 435,686	$55,280	€59,438
1%	$154,479	₹ 435,686	$57,894	€59,438
2%	$160,194	₹ 435,686	$61,069	€59,438
3%	$167,784	₹ 435,686	$65,044	
4%	$179,099	₹ 435,686	$70,220	
Risk free Rate	4.78%	5.00%	4.00%	-0.50%
ROIC	10.00%	10.39%	15.00%	5.00%
Cost of capital	8.08%	10.39%	10.01%	5.00%

II. The loose ends in valuation…

A premium here, a discount there, and soon you are where you wanted to be in the first place..

Getting from DCF to value per share: The Loose Ends

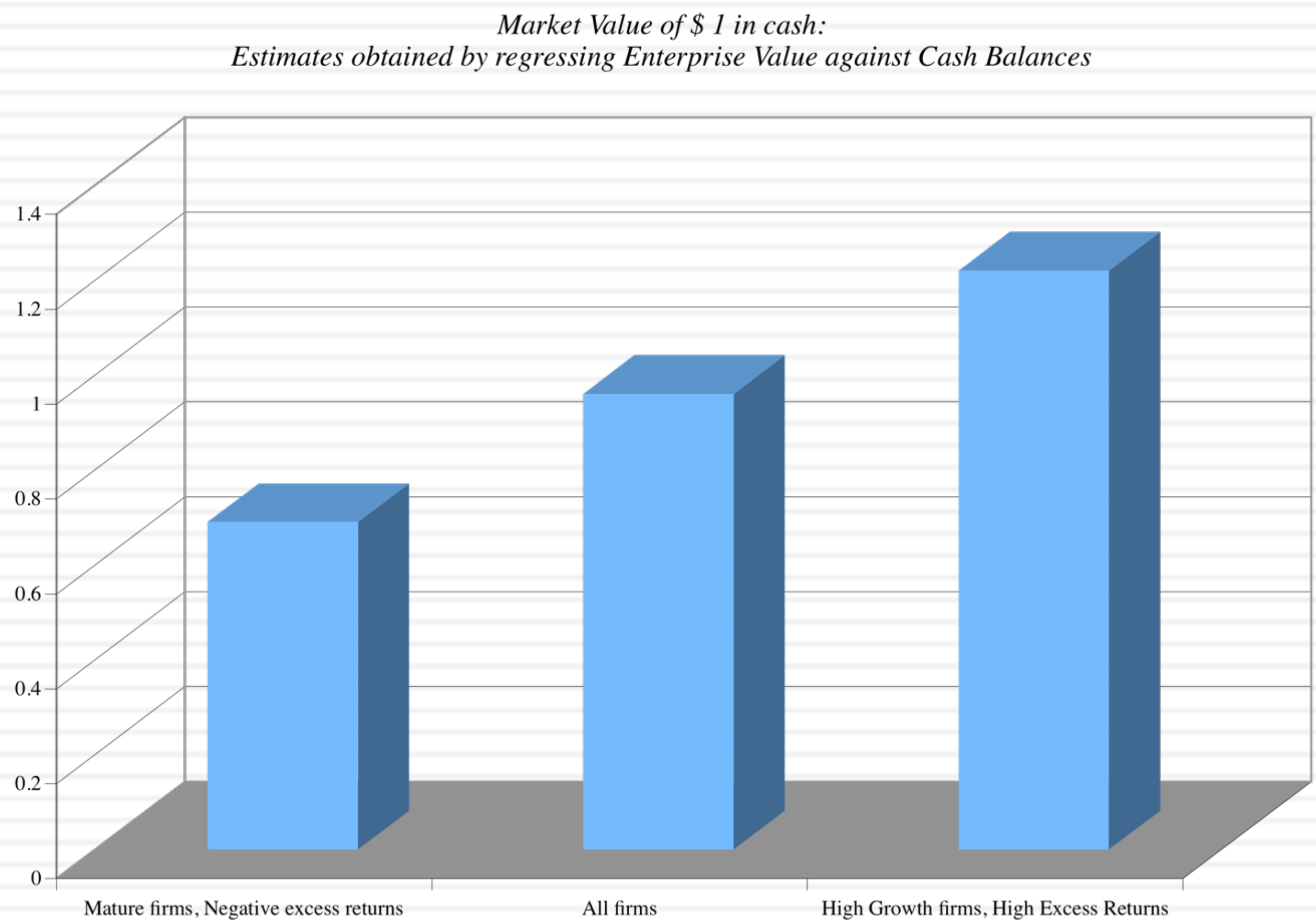


1. The Value of Cash
An Exercise in Cash Valuation

	Company A	Company B	Company C
Enterprise Value	$ 1 billion	$ 1 billion	$ 1 billion
Cash	$ 100 mil	$ 100 mil	$ 100 mil
Return on Capital	10%	5%	22%
Cost of Capital	10%	10%	12%
Trades in	US	US	Argentina

- In which of these companies is cash most likely to trade at face value, at a discount and at a premium?

Cash: Discount or Premium?



2. Dealing with Holdings in Other firms

- Holdings in other firms can be categorized into
  - Minority passive holdings, in which case only the dividend from the holdings is shown in the balance sheet
  - Minority active holdings, in which case the share of equity income is shown in the income statements
  - Majority active holdings, in which case the financial statements are consolidated.
- We tend to be sloppy in practice in dealing with cross holdings. After valuing the operating assets of a firm, using consolidated statements, it is common to add on the balance sheet value of minority holdings (which are in book value terms) and subtract out the minority interests (again in book value terms), representing the portion of the consolidated company that does not belong to the parent company.

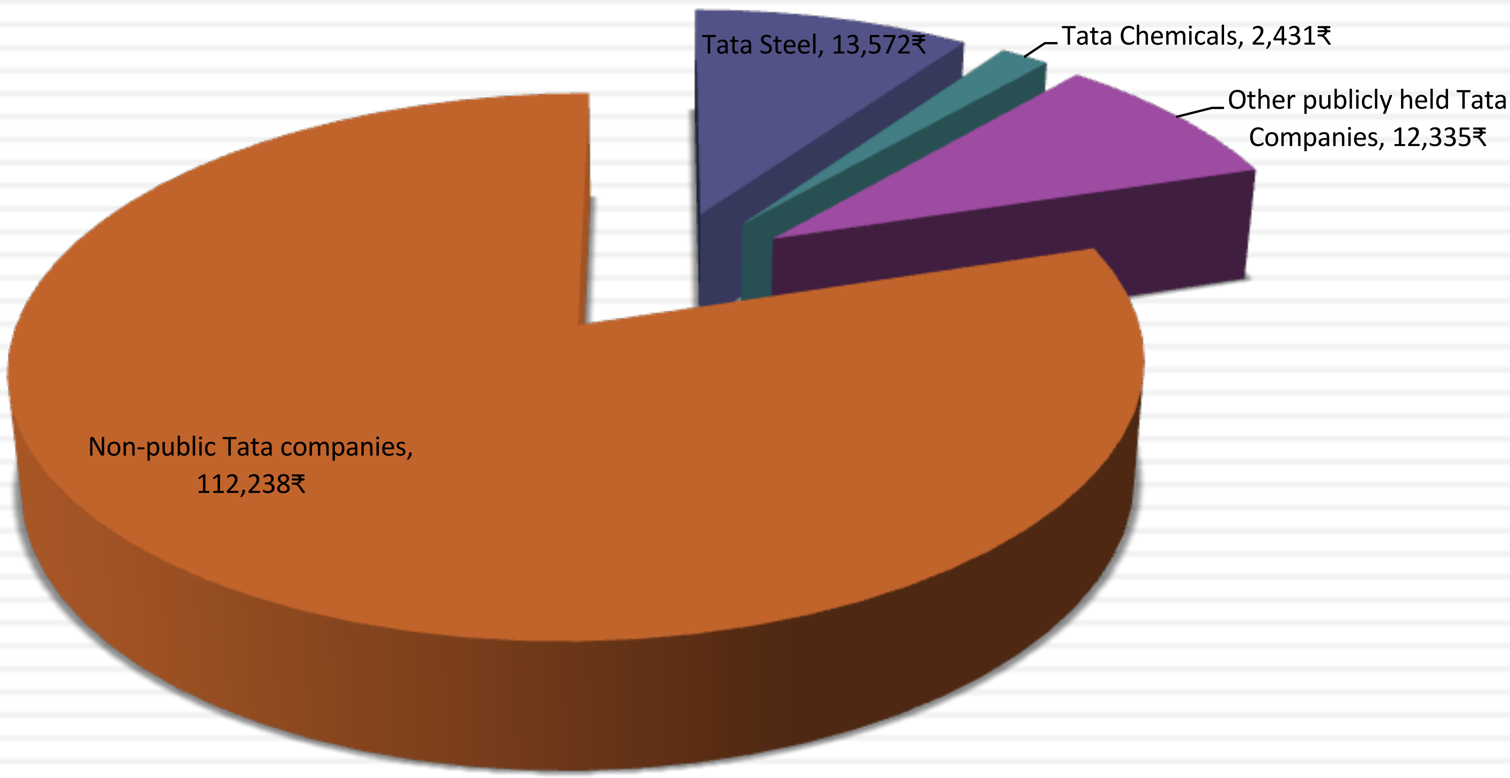
How to value holdings in other firms.. In a perfect world..

- In a perfect world, we would strip the parent company from its subsidiaries and value each one separately. The value of the combined firm will be
  - Value of parent company + Proportion of value of each subsidiary
- To do this right, you will need to be provided detailed information on each subsidiary to estimate cash flows and discount rates.

Two compromise solutions…

- The market value solution: When the subsidiaries are publicly traded, you could use their traded market capitalizations to estimate the values of the cross holdings. You do risk carrying into your valuation any mistakes that the market may be making in valuation.
- The relative value solution: When there are too many cross holdings to value separately or when there is insufficient information provided on cross holdings, you can convert the book values of holdings that you have on the balance sheet (for both minority holdings and minority interests in majority holdings) by using the average price to book value ratio of the sector in which the subsidiaries operate.

Tata Motor’s Cross Holdings



3. Other Assets that have not been counted yet..

- Unutilized assets: If you have assets or property that are not being utilized (vacant land, for example), you have not valued it yet. You can assess a market value for these assets and add them on to the value of the firm.
- Overfunded pension plans: If you have a defined benefit plan and your assets exceed your expected liabilities, you could consider the over funding with two caveats:
  - Collective bargaining agreements may prevent you from laying claim to these excess assets.
  - There are tax consequences. Often, withdrawals from pension plans get taxed at much higher rates.
- **Do not double count an asset.** If you count the income from an asset in your cash flows, you cannot count the market value of the asset in your value.

An Uncounted Asset?

Price tag: $200 million

The longtime home of Playboy magazine founder Hugh Hefner is to be sold to Daren Metropoulos, a principal at private-equity firm Metropoulos & Co. PHOTO: GETTY IMAGES

The "real estate" play

- Assume that Accor Hotels, a hotel company, has real estate investments underlying its operations. Assume that you estimate a real estate value of $1.5 billion for the real estate. Can you add this value on to your DCF value that you get for the hotel business?

a. Yes.
b. No.
c. Depends

- What would you do if the value of the land exceeds the present value that you have estimated for them as operating assets?
  a. Nothing
  b. Use the higher of the two values
  c. Use the lower of the two values
  d. Use a weighted average of the two values

4. A Discount for Complexity: An Experiment

	Company A	Company B
Operating Income	$ 1 billion	$ 1 billion
Tax rate	40%	40%
ROIC	10%	10%
Expected Growth	5%	5%
Cost of capital	8%	8%
Business Mix	Single	Multiple Businesses
Holdings	Simple	Complex
Accounting	Transparent	Opaque

- Which firm would you value more highly?

Measuring Complexity: Volume of Data in Financial Statements

Company	*Number of pages in last 10Q*	*Number of pages in last 10K*
General Electric	65	410
Microsoft	63	218
Wal-mart	38	244
Exxon Mobil	86	332
Pfizer	171	460
Citigroup	252	1026
Intel	69	215
AIG	164	720
Johnson & Johnson	63	218
IBM	85	353

Measuring Complexity: A Complexity Score

Item	Factors	Follow-up Question	Answer	Weighting factor	Gerdau Score	GE Score
Operating Income	1. Multiple Businesses	Number of businesses (with more than 10% of revenues) =	1	2.00	2	30
	2. One-time income and expenses	Percent of operating income =	10%	10.00	1	0.8
	3. Income from unspecified sources	Percent of operating income =	0%	10.00	0	1.2
	4. Items in income statement that are volatile	Percent of operating income =	15%	5.00	0.75	1
Tax Rate	1. Income from multiple locales	Percent of revenues from non-domestic locales =	70%	3.00	2.1	1.8
	2. Different tax and reporting books	Yes or No	No	Yes=3	0	3
	3. Headquarters in tax havens	Yes or No	No	Yes=3	0	0
	4. Volatile effective tax rate	Yes or No	Yes	Yes=2	2	0
Capital Expenditures	1. Volatile capital expenditures	Yes or No	Yes	Yes=2	2	2
	2. Frequent and large acquisitions	Yes or No	Yes	Yes=4	4	4
	3. Stock payment for acquisitions and investments	Yes or No	No	Yes=4	0	4
Working capital	1. Unspecified current assets and current liabilities	Yes or No	No	Yes=3	0	0
	2. Volatile working capital items	Yes or No	Yes	Yes=2	2	2
Expected Growth rate	1. Off-balance sheet assets and liabilities (operating leases and R&D)	Yes or No	No	Yes=3	0	3
	2. Substantial stock buybacks	Yes or No	No	Yes=3	0	3
	3. Changing return on capital over time	Is your return on capital volatile?	Yes	Yes=5	5	5
	4. Unsustainably high return	Is your firm's ROC much higher than industry average?	No	Yes=5	0	0
Cost of capital	1. Multiple businesses	Number of businesses (more than 10% of revenues) =	1	1.00	1	20
	2. Operations in emerging markets	Percent of revenues=	50%	5.00	2.5	2.5
	3. Is the debt market traded?	Yes or No	No	No=2	2	0
	4. Does the company have a rating?	Yes or No	Yes	No=2	0	0
	5. Does the company have off-balance sheet debt?	Yes or No	No	Yes=5	0	5
No-operating assets	Minority holdings as percent of book assets	Minority holdings as percent of book assets	0%	20.00	0	0.8
Firm to Equity value	Consolidation of subsidiaries	Minority interest as percent of book value of equity	63%	20.00	12.6	1.2
Per share value	Shares with different voting rights	Does the firm have shares with different voting rights?	Yes	Yes = 10	10	0
	Equity options outstanding	Options outstanding as percent of shares	0%	10.00	0	0.25
		Complexity Score =			48.95	90.55

Dealing with Complexity

- In Discounted Cashflow Valuation
  - The Aggressive Analyst: Trust the firm to tell the truth and value the firm based upon the firm's statements about their value.
  - The Conservative Analyst: Don't value what you cannot see.
  - The Compromise: Adjust the value for complexity
    - Adjust cash flows for complexity
    - Adjust the discount rate for complexity
    - Adjust the expected growth rate/ length of growth period
    - Value the firm and then discount value for complexity
- In relative valuation
  - In a relative valuation, you may be able to assess the price that the market is charging for complexity:
  - With the hundred largest market cap firms, for instance:

PBV = 0.65 + 15.31 ROE – 0.55 Beta + 3.04 Expected growth rate – 0.003 # Pages in 10K

5. The Value of Synergy